

# electrical contracting

With which is consolidated *The Electragist and Electrical Record*  
Established 1901

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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## McGRAW-HILL PUBLISHING COMPANY, INC.

JAMES H. McGRAW, Founder and Honorary Chairman

Publication Office, 99-129 North Broadway, Albany, N. Y.

Editorial and Executive Offices, 330 W. 42nd St., New York, N. Y.

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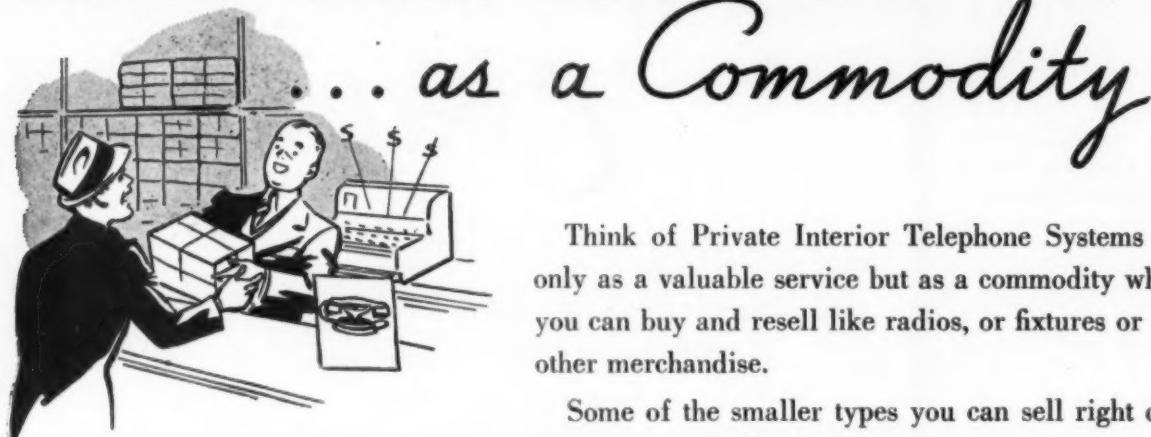
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Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwyck House, Aldwyck, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta. Published monthly, price 25 cents a copy. Vol. 37, No. 9. Subscription rates: U. S., Canada, and Latin-American republics, \$2 a year; all other countries, \$2.50 a year. Entered as second-class matter August 29, 1936, at Post-office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. Copyright 1938, by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A.B.P. Member A.B.C.

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# electrical contracting

SEPTEMBER, 1938

## The Price of Life

IT MAKES A POOR VACATION. But I have just spent a few weeks in the hospital enjoying pneumonia. White linen nurses. You know. Pretty laboratory gals in for another drop of blood at 15 per. All your money gone and the doctor not paid. But as the price of life, not too much.

AND YOU THINK OF THINGS. I even worried about the electrical contractor. God help us! And what he ought to do to get saved, with no hospital handy. I turned this over in my mind—or whatever it is.

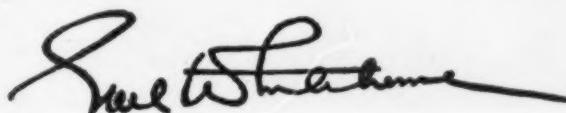
ONE THING STOOD OUT ABOVE THE REST. Nobody knows much about the electrical contractor—and it's doing him a lot of harm. Nobody knows how many and where and what he is and does and why and how and who for. And what is the result?

WHY, THROUGHOUT THE INDUSTRY, manufacturers and wholesalers make their plans for distributing and marketing products with no clear picture of this contractor—what he can do. Too often they set up no definite provision for him in the selling plans, the discount schedules. It makes plenty trouble. The contractor loses most and feels hurt.

I DROP THIS THOUGHT IN NECA'S LAP, therefore, ahead of the convention in Detroit. The contractor needs to be set right in the picture of electrical distribution. The whole electrical industry must see him clearly—what he buys and from whom, what he sells and where. I mean, an accurate report on the broad field, not just figures on this few or that—approximate within a row of apple trees.

THIS CONTRACTOR DEVELOPES MARKETS. He knows product trends. He moves materials. He influences consumers. From him, each quarter, could be marshalled such vital facts for the manufacturer, wholesaler and himself. It would establish him quite visibly, the key link in the distribution chain.

HARD TO DO? YES—BUT WHAT OF IT? It is again the price of life—a better life, wrought from a richer opportunity. Our contracting industry is big enough to get the knowledge that it needs.





# Star customer!

Electrical Contractors have always been "star customers" to us.

That's why we've shaped our business to meet the Contractor's needs completely...to give him prompt service...to make our products conveniently available to him.

Regardless of what kind of work you specialize in, you'll find Graybar equipped to serve

you with *everything electrical*. You'll find a well-stocked Graybar warehouse near you to supply *what* you want...*when* you want it...*where* you want it. You'll find Graybar specialists in particular lines always glad to help you with experienced advice.

Try Graybar for everything you need. We're only as far away as your telephone.

Everything electrical for all  
types of Contracting—



# GraybaR



OFFICES IN 85 PRINCIPAL CITIES...EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK, N. Y.

**FINAL INSPECTION**—Perhaps the toughest lighting problem in auto making is the final inspection line. Here 500-watt incandescents spaced  $5\frac{1}{2}$  ft. apart along center and side rows, give 80/90 f.c.

# Ideas



## from the Automobile Plants

REMENDOUS load values, integrated production, uncanny accuracy, automatic functions—these are some of the highlight impressions that remain with electrical men who see Detroit's automobile plants in action. Here, mass production technique is at its highest peak and the life blood that makes it possible flows through electrical arteries. From transformer stations and special generators, the maze of feeder systems radiate to the newest of multi-motored machine tools, to welders and furnaces, to plating machines and thousands of motorized tools needed along the never-faltering assembly lines.

The automobile manufacturer has

Some interesting electrical applications in the Packard and Plymouth Plants that make possible spectacular performance in mass auto production.

By Frank J. Seiler and William T. Stuart

taken the human effort out of those operations which a machine performs. In a word, the grunt is gone from auto making. Thus hoists and cranes do the lifting or lowering. Overhead conveyors carry parts to the assembly stations. Automatic controls, measuring and testing devices, safety stops, speed regulators, all contribute their latest electrical developments to check-mate human-error, and to cut the cost in this industry.

It has been said that anyone who develops a useful electrical idea which can be applied to advantage in the motor car industry need only show it. Therefore, such revolutionary items as trolley-bus systems, light-on-wheels, space-saving panelboards, plug-in bus bar distribution, and other innovations now widely applied in the industrial wiring field were tried out under grueling performance tests in Detroit plants. If they filled the auto makers' needs

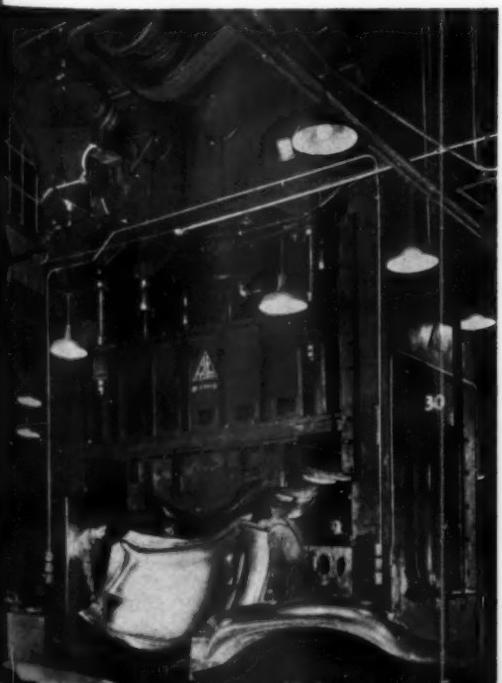
they were certain to be widely applied elsewhere.

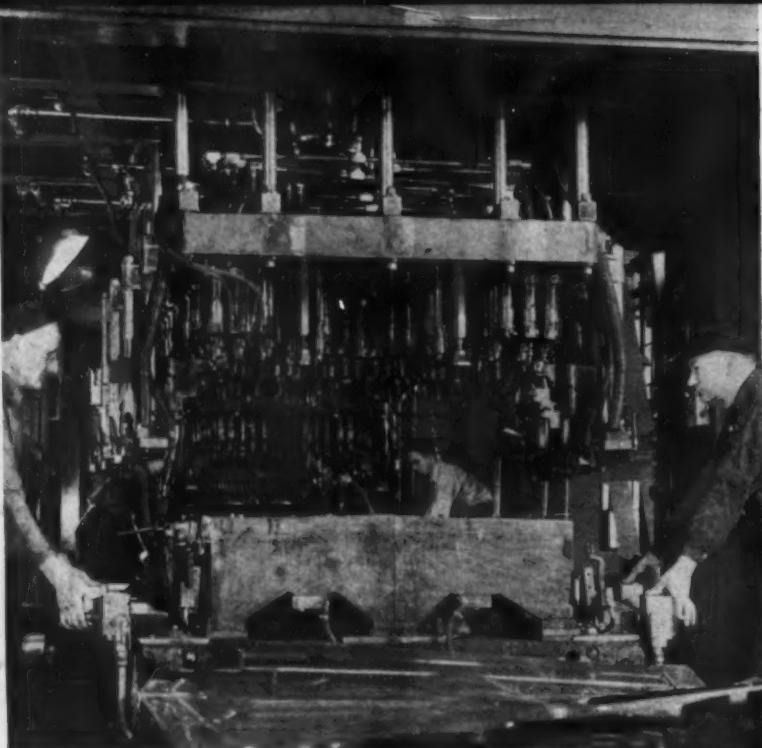
The design of motors and control equipment has also been influenced by this incentive for mass automobile production. For example, welders have become portable tools or guns suspended along the line. It takes individual 50 kva transformers to impart the 3 to 8-cycle welding shot. Gang welders make 200 welds in one automatic series of shots lasting only a few seconds. Such revolutionary developments required precision timing relays, lightning-fast contactors, all new jobs in control technique and research, but "musts" for the auto shops.

Their amazing machine tool robots brought new ideas, motor applications and integrated automatic control. For example, machines with eighteen motors, go through such automatic cycles as shaving axles, boring engine blocks, cutting gears, and grinding fine bearing surfaces to fractional-thousandths-inch specifications. Some machine operations take only seconds, because magnetic chucks and automatic controls have revolutionized time factors.

Again in hardening steel, tempering, plating and enameling, new uses of

**STEEL MAGIC**—Packard's roof panel press yields a stamping blow of 525 tons and forms a steel panel 14 feet by 7 ft. The press weighs 135 tons and the dies 75 tons. Push buttons and safety treadles control three motors.





**PROGRESSIVE WELDING**—Push buttons "fire" this array of 200 welding guns at the Packard plant, which hit ten or twelve spots simultaneously. Six 150 kva. transformers are supplied by 440-volt feeders to provide 3/6 volt welding power.

**LUSTRE THERAPEUTICS**—For finishing touches to Plymouth cars, special lamp brackets focus box lights, each comprising twenty 250-watt therapeutic lamps, for local baking treatments at 250 degrees.



power and control hold the spotlight. Cam shafts are now hardened by induction in five minutes, where the job formerly took 15 hours. Steel wheels are sprayed and then baked by the hysteresis effect of 360-cycle power.

And this advanced technique is seen in lighting as with other electrical developments. Pioneers in adapting low-pressure mercury vapor lighting on a large scale, each new design for improved industrial illumination has received a fair trial here. Critical seeing tasks, such as inspection of body finishes, checking colors and plated parts, measuring and gauging close-fitting parts, bring into play every instrument of good lighting. There are booths where massed indirect units consume 40 and 50 kw., as at the Packard plant. Work areas commonly have up to 75 f.c. of general illumination. Spray booths or tunnels are clustered with high intensity spotlights. Long inspection lines present a myriad of reflectors often projecting from a three-row directional arrangement. Lighting feeders and transformers run large. But management feels amply repaid for the mass use of lighting.

The use of electricity in auto making can best be summed up under these 15 major functional divisions—

1. *Foundry and forging*—Heavily motorized, using ingeniously integrated controls throughout.

2. *Metal working*—Multi-motored machines for milling, boring, shaving and grinding precision parts.

3. *Stampings and body presses*—Huge machines that respond to finger-tip and treadle control impulses.

4. *Welding*—New technique using mass power and requiring unusually heavy transmission systems.

5. *Plating, tempering, enamelling*—Special current applications using up to 2000-cycle frequencies from large generators.

6. *Conveyors, hoists, trucking*—Motors everywhere tied together by an amazing network of interlocks and sequence controls.

7. *Engine balancing and tests*—Precision instruments and dynamometer equipment, where often 250 engines are tested at one time.

8. *Small motorized assembling tools*—

Forests of suspended motor-driven tools requiring separate special frequency wiring systems.

9. *Illumination*—All types of general and local applications ranging into extremely heavy loads.

10. *Spraying and baking*—Heavy loads for unique power applications and air circulation.

11. *Air conditioning and ventilation*—Millions of cubic feet of air changed automatically and conditioned for worker comfort and special processes.

12. *Compression and pumping of air and liquids*—Piping filled with power for air tools, and various processing fluids, all dependent upon large-scale compression or pumping.

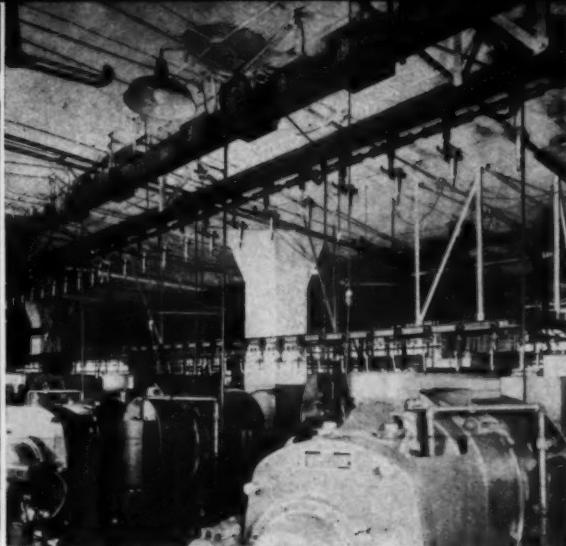
13. *Electrical control, testing and*

**INDUCTION TEMPERING**—Electrical induction heats Packard cam shafts individually to 1500 degrees in 4.7 seconds, then a spray of water does the quenching. A 160-kw. 800-volt, 2000 cycle generator supplies this battery. Each section has an integral 800/25 volt transformer unit.





**PRECISION PLUG-IN**—This Plymouth worker inserts an electric plug gauge to measure cylinder bores. The exact size in half-thousandths of an inch is registered on the operator's block dial.



**FLEXIBLE POWER SUPPLY**—Closely spaced machines, in the Packard gear cutting department, have plug-in-bus systems of distribution. Special heavy duty non-metallic sheathed power cables are used.



**GANG DRILLING**—The Packard cylinder block line has automatic controls for its gang drills. One man can operate two or three machines, as they complete their drilling cycle independently.

**measuring instruments**—Human effort and error check-mated wherever controls or instruments could be applied.

**14. Signalling and communication**—Production flow supervised by signals of all sorts from myriads of lamp signals, gongs, and whistles to elaborate telephone systems in remotest locations.

**15. Generation and conversion of special power requirements**—Huge 4600-volt synchronous motors driving special generators for supplying current at odd voltages and frequencies.

As evidence that loads run high, Plymouth, in a typical month, shows power consumption running nearly 24 million kwh's. This plant is said to have the most dollar production per square foot of floor area in the automobile industry. Plymouth, in Detroit, is set up to produce 2,100 cars per day. This complex integration of processes requires 13,400 horsepower in motors and a vast amount of welding apparatus besides. They burn light to the tune of almost 4 million kwh. per month.

**TROLLEY POWER**—A Plymouth line, where 180-cycle motorized tools of various types, can be moved near the work without hazard of trailing cords.

To coordinate all these complex demands upon the electrical system, these governing principles apply in nearly all plants—

1. All apparatus and wiring systems must be as nearly trouble-free and safe as can be provided.

2. Floor and ceiling space must be fully utilized, therefore production layouts are extremely compact. Close clearances for conduits and busses, controls, motors and drives are unavoidable.

3. Electrical systems must be extremely flexible to permit quick rearrangement to suit changes in production. Machines to be moved, are sometimes made ready to operate electrically before millwrights have finished re-setting them.

4. Lighting systems must be readily flexible to provide proper seeing conditions for any changed layout of machines.

5. Equipment for the entire plant must be standardized to reduce maintenance costs. This applies particularly to sizes of conduit and cable, types of

fittings, lighting units, sizes of lamps, sizes of transformers, capacitors and switchgear.

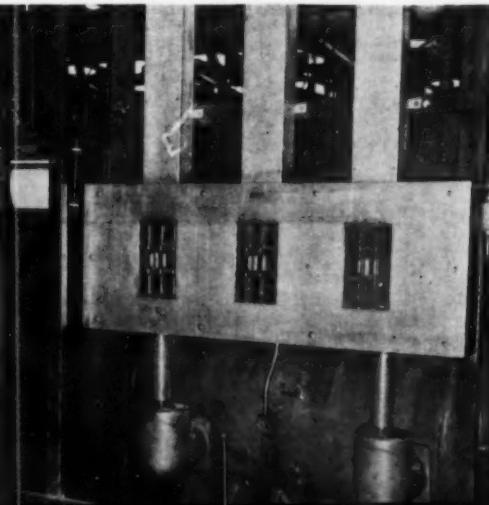
6. Motors must be closely rated to their burdens to economize in power factor and efficiency. Plymouth, for example, maintains 93 per cent power factor.

7. Automatic multiple-motored machines, complex cycles of operation, special current and control systems and complex signals, all demand highly skilled electricians to assure continuous line production.

8. Spare motors must be immediately available for a wide range of machines. At the Packard plant, 250 to 300 spare motors, ranging to 100 hp. in size, are kept in readiness for instant use and carefully identified for the kinds of machines they drive.

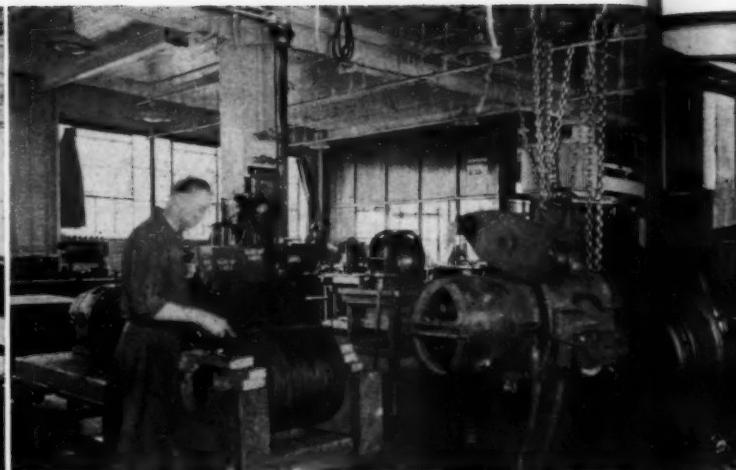
Meeting the everyday electrical problems in modern automobile plants calls for highly coordinated staffs. Packard, for instance, employs 200 men, headed by a chief electrical engineer of the plant engineering division. His staff is comprised of seven departments, in charge of: engineering, construction, shop maintenance, general maintenance (again divided into three zones), welder maintenance, elevators, cranes and hoists, and industrial trucks (comprising a fleet of 125 gasoline and electric vehicles).

Plant alterations require extreme care, because they are usually big jobs which must be done quickly. Exacting layouts and specifications are prepared in advance, and it is not unusual for one plant to let new wiring contracts in one building to several electrical contractors. Jobs are zoned so that sometimes six different firms can come in and work efficiently without interference or confusion.





MASS PRODUCTION—A peek-in at the Miller-Seldon shop caught a section of the second-floor workers doing things for motordom cripes. Auto plant principles of equipment handling are in evidence.



SPECIAL JOBS—From the auto plants come repair troubles like this 10-h.p. d.c., 5-ton Sheppard hoist, and the solenoid coil (left) for a large magnetic ally operated brake. (Miller-Seldon Shop)

# Detroit Motor Shops

IT IS said that more motor repair work is controlled by purchasing agents and plant staffs of Ford, General Motors, Chrysler, Packard and other automobile manufacturers centered in Detroit than by any other group of that many industrials in any other city. Loads run high and the closely-motored machines used in motor plants represent the largest burn-out problem of any like number of motor horsepower to be found elsewhere.

Packard alone has 9000 motors, not counting fractionals, and totalling above 33,000 hp. And in addition, it has some 37,000 kva. in transformers, of which 18,000 kva. supplies welding equipment. Other plants run even larger loads. On top of this, no one knows how many small motorized tools, magnets, coils and other electrical gadgets are constantly undergoing reconditioning.

The local motor service shops are so in the whirl of Detroit's mass production that they have also become yardsticks of fast production. They have devised abuse-proof methods and developed new techniques that have spread to many other sections of the country, as they have been passed on to the regional production and assembling plants of the big motor car companies.

## How Detroit shops perform in this vortex of mass power usage

Here are some of the smart things the Detroit shops do to serve these big customers—

1 To gear their production to the big plant schedules, Detroit shops have elaborate test facilities, conveyorized production lines, special solvent systems, sand blast booths, fine winding and connecting devices, heavy apparatus departments, modern welding and machine shop equipment, adequate haulage, and elaborate cost and data systems.

2 Shops are manned to work, 8, 16 or 24 hours at full efficiency.

3 Every type of modern equipment is available to handle a wide variety of industrial apparatus from delicate controls and flea-power motors to heavy-duty units.

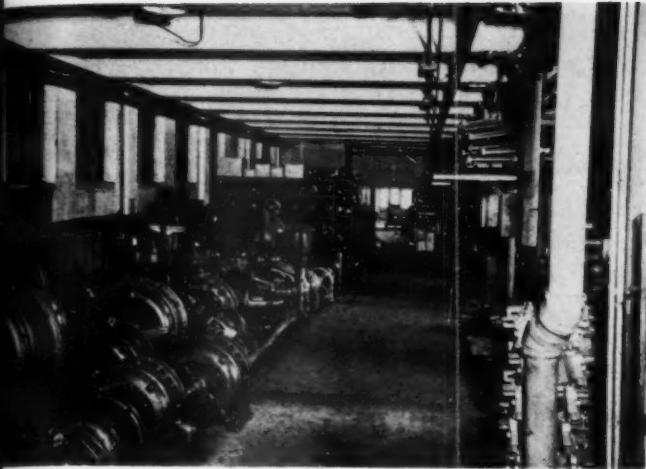
4 The shops keep posted on all latest electrical applications of welding, furnaces, automatic controls, electronic and magnetic devices, transformers and special conversion equipment, power factor correction, unusual motor hook ups and small motorized tools.

5 Heavy stocks of emergency equipment and spare parts are provided to insure quick service. Some shops stock spare starters which can be exchanged to avoid over-time and rushed workmanship.

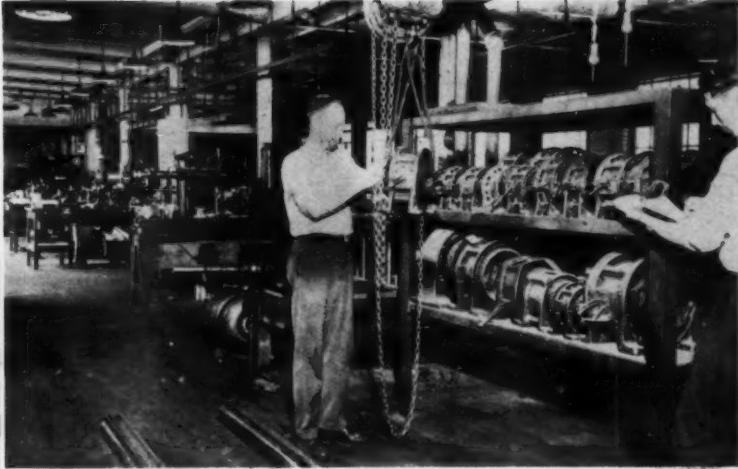
6 Shops are constantly working with iron and steel engineers, machine tool designers and the plant staffs, to apply new electrical ideas, to increase efficiency, speed production, and lower electrical maintenance costs.

Some Detroit shops specialize on high-cycle tools, welding transformers, solenoids, relays and the like. One such shop employs about 40 mechanics and billed \$20,000 in November, 1936, and took in 40 to 50 high-cycle tools per day. Tools are transported in special locked carrying cases which hold 24 to 30 units. These jobs run from \$1.50 to \$75 each. One auto company's tools have a long-time average repair cost of \$5 each. Other types are billed at \$12 to \$15 each. One automobile manufacturer is reported to spend 50¢ per finished car for upkeep or maintenance of its small motorized tools.

Back of these successful shops in Detroit is also an interesting history of voluntary cooperation. In 1933 the Electrical Repair Association of Detroit was organized to promote greater efficiency in motor shop work. There are some 30 members, who pay no dues, have no "musts" and no "shalt nots."



READY STOCKS—Detroit shops keep heavy stocks ready for rush orders. Here are some of Spaulding's industrial motors up to 200 h.p., and large transformers, all in the pink for an SOS.



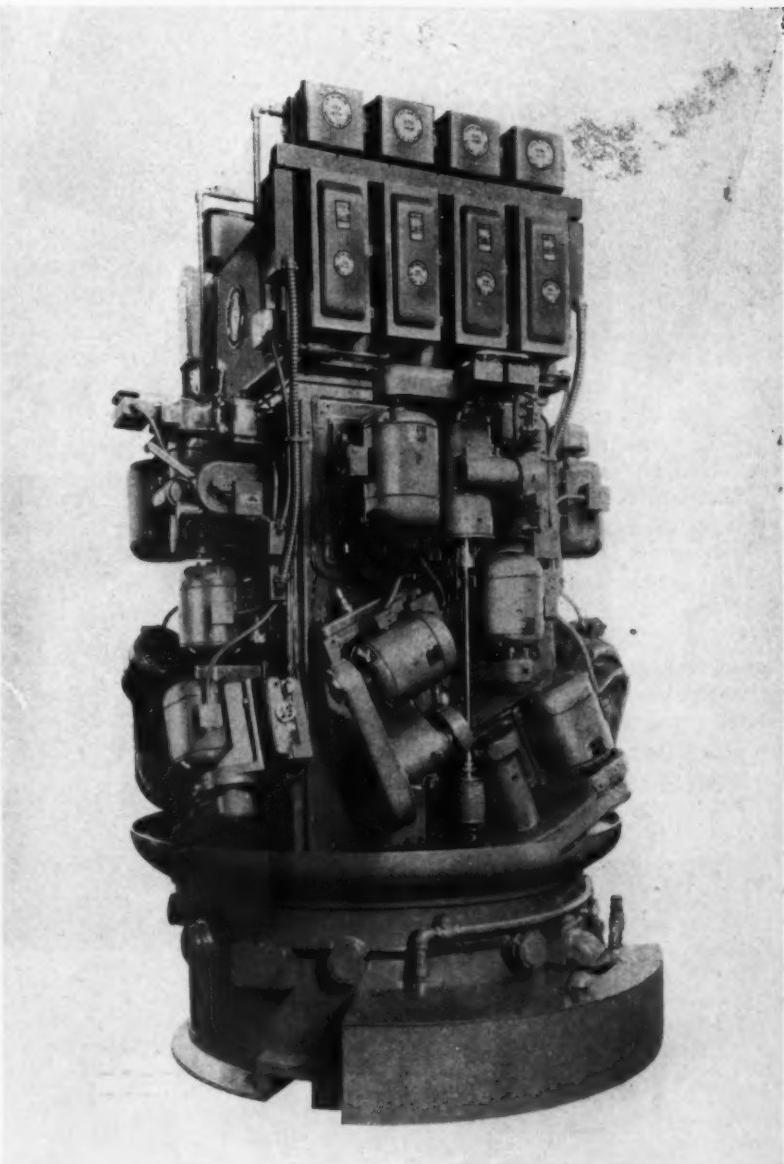
IMMEDIATE REPLACEMENT—Checking out a spare stator at the Spaulding shop, where  $\frac{1}{2}$  to 15 h.p., 1200 to 1800 rpm. motors are renewed without overtime high cost production.

## Tie In . . .

Marshall G. Pearce, of Fife-Pearce, is now president and Howard E. Van Alstyne, of Miller Seldon, is secretary.

Monthly luncheons are held to provide an opportunity for the interchange of new production methods and management ideas. Here men bring up ticklish problems and get advice. Cards are laid on the table as to production costs and overhead. Members patronize each other, to take advantage of special skill in transformer work, high-speed or high-cycle jobs and other out-of-the-ordinary work. They exchange employment and personnel data. Together they have developed cooperation with manufacturers in applying new equipment and modifying it for special applications. And through it all they have maintained a keen cooperative spirit, high quality standards, reasonable prices, low production costs, and preserved a fair profit for the work.

As a result of all this the shops of Detroit are growing beyond the conventional repair service function. New machine tools seem to pop up over night around Detroit, and the larger shops have become specialists on assembling intricate grouped control, and applying motors to these new brain children of the tool builders. It's complicated work, but these shop men like it and they are making a name for themselves.



MACHINISTS ROBOT—Motor shop engineers applied eighteen 2 to 5 h.p. special motors and automatic controls to this 25-ft. tall, revolving axle-shaving machine. It does two axles in 56 seconds.



How the Ford Organization Plans Electrical Systems for Coming Generations

# Wiring in Greenfield

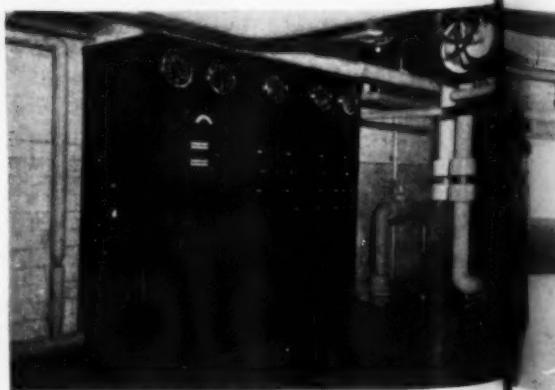
The wiring and equipment layout includes these noteworthy design features:

- 1 Lighting uses No. 10 conductors or larger, with outlets balanced on 3-phase 4-wire circuits.
- 2 All switches and receptacles are 20-amp. rating.
- 3 Attic fans and ventilator motors are speed-controlled in the basement, at gauge and control board.
- 4 All motor controls have individual copper-oxide rectifiers for supplying d.c. coil energy.
- 5 The 1200-foot tunnel connecting this building with the central heating plant has alternately controlled lighting outlets on three-way switches.
- 6 The swimming pool is lighted to 42 foot candles. Time-delay relays and master-remote control switches bring on



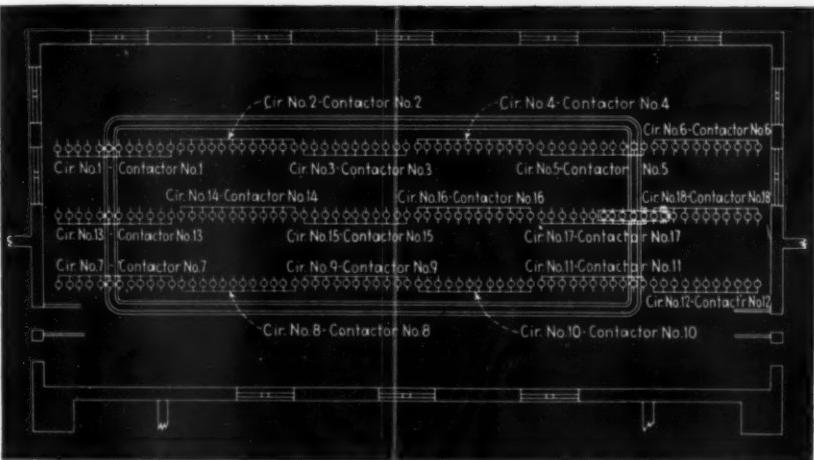
TUNNEL TECHNIQUE—For 1200 feet this tunnel to the central heating plant, with alternately controlled lights, presents a neat and lasting example of coordination. Two lead-covered wire circuits required  $1\frac{1}{2}$ -in. conduit.

CONTROL WIZARDRY—For eight adjustable-speed roof motors, this control, pilot and gauge board gives all the pulse beats. Each motor requires ten to fourteen conductors in  $1\frac{1}{2}$ -in. conduit from this point.



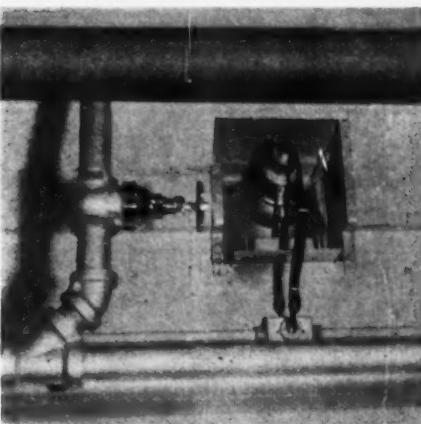
THOUSANDS of visitors each year enjoy the historic restorations at Greenfield Village in Dearborn, near Detroit. Here Henry Ford has transported Edison's Menlo Park Laboratories and many other famous buildings. But flanking all these interesting antiquities, Mr. Ford has erected great new structures, the Edison Institute Museum and others, of which the most recent is the Edison Institute of Technology and Recreation Building. It has been built to stand for many generations, and with that end in view the best that science has to offer in mechanical equipment has been provided.

This building contains chemical, physical and electrical laboratories, a large ball room, a library, a lounge, a gymnasium, a 75,000-gallon swimming pool, and locker rooms. There are also offices, a complete laundry and an all-electric kitchen in this structure. It is completely air conditioned. The electrical system installed by the McCleary-Harmon Company cost \$95,000.



**STEP-BY-STEP**—As pilot-controlled sequence relays function, 18 circuits for 273 ceiling lamps of 150-watts come on in pleasing sequence without any jolt to the eye or system.

**TANK LIGHTS**—How the twenty pool flood-lights were set into gasketed glass ports to project into the electrically chlorinated swimming pool.



# Village

the eighteen ceiling light circuits in pleasing step-by-step succession, which also prevents an inductive "bump" on the feeder system and minimizes excessive pitting on the main contactor.

**7** All live parts are armored and grounded, and all rotating parts guarded. Also, the 4600-volt transformers are of the noninflammable Pyranol type requiring no enclosure. Thus students may pass freely among the equipment without possibility of coming in contact with live parts, or of being injured by rotating machinery.

To assure adequate electrical service, three 4600-volt 200,000-c.m. underground feeders were brought in. One

supplies the 200-hp. compressor motor for the air conditioning system, while separate feeders supply two 450 kva. 3-phase transformers. Network protectors permit these transformers to be operated singly or in parallel, if the load ever requires it. Secondary feeders, from each transformer to the 19-breaker main switchboard, comprise four 4½-in. conduits with four 500,000 c.m. cables in each. Through the 1200-ft. tunnel are four 2-in. and one 3-in. conduits containing special cables, which provide connections from the village systems for telephones, watchman system, fire alarms, emergency and time system.

The outstanding feature of this installation is perhaps the fact that everything was planned for long-time, trouble free operation. The electrical system presents an outstanding example of good design, careful selection of products and exacting installation technique.

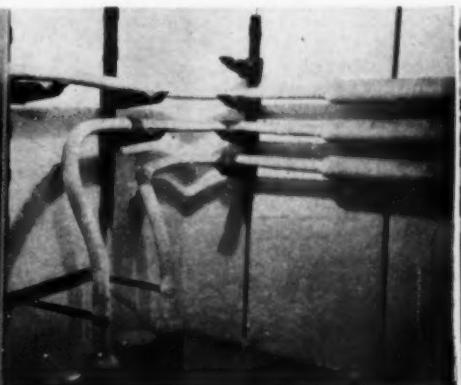
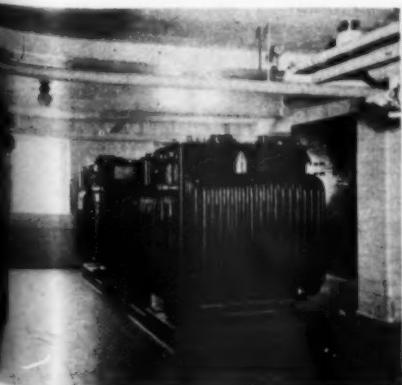
**BEHIND THE BOARD**—Two 450 kva. Pyranol transformers with protective devices mounted integrally, and at left the oil breaker controlling 200-hp. 4600-volt motor.

**MORE SPACE**—Spares everywhere, as provided in this spacious cable room, where three incoming 2300-volt feeders enter their underfloor conduits.

## Some Village School Highlights

- 15 Secondary Clocks
- 3 In-and-Out Recorders
- 14 Fire Alarms
- 16 Telephones
- 8 Speakers
- 12 Temperature Controls
- 12 Radio Connections
- 16 3-phase Scrubbing Machine Outlets
- 6 Washroom Hand-Dryers
- 20 Submarine Floodlights for Pool
- 492 Lighting Branch Circuits
- 35 Motors (to 200 h.p.)
- 1 Emergency Panelboard
- 2 Special Laboratory Panels
- 20 Lighting Panelboards
- 8 Power Panelboards
- 2 450 kva. 3-phase Pyranol Transformers

**FINISHED CONSTRUCTION**—Careful planning and coordinated craftsmanship made this 19-breaker, dead-front main switchboard fit its ultra-modern surroundings.



# THESE Contractors Work Together

The Wolverine State Electrical Contractors Association takes in 39 county groups all over Michigan. Detroit also ties in.

**T**O DAY Michigan has the fastest growing electrical contractors organization in the country. Starting from scratch in January of this year, this organization swept rapidly over the state and included by June over 60 per cent of the licensed contractors. Officers claim that before the year is out few counties will be left unorganized.

In the early part of 1937 only a few contractor associations were functioning in the state, three of these in the Detroit metropolitan district. But organization was in the air, and a state wide set-up seemed to be a logical sequel to the 1935 Michigan license law. Gradually, during 1937 the number of local groups about the state increased to 15 and in the fall, temporary organizing committees began to encourage

the formation of county groups. Plans were laid for the first meeting to take place in January 1938 with Wallie G. Campbell of Grand Rapids acting as temporary chairman.

The first official meeting was held in Grand Rapids attended by 35 electrical contractors. Campbell was elected president, K. E. Blackman of Battle Creek became vice president and F. J. Groleau of Muskegon, treasurer. Harold B. Gelders, long active in the Grand Rapids Electric Club, was chosen as secretary.

Under the by-laws, county or local contractor associations are accepted as a body, with one representative from each group acting as a member of the Board of Governors which supervises the business of the organization. By June 1938, the Board had grown to 39 members. Attendance at the monthly meeting now runs over 200 and growth has been so rapid that there is no accurate count of the individual members. The indications are that there are now 1800 enrolled out of a possible 2800 contractors in the state.

Here are the definite objectives these men are working for—

- 1 To promote good fellowship and cooperation among electrical contractors.
- 2 To collect and distribute to members information on matters affecting their business.
- 3 To build more friendly relations with other branches of the electrical industry.
- 4 To aid in marketing high grade materials and apparatus.
- 5 To cooperate with the inspectors in developing and establishing proper standards for materials and installations.
- 6 To work with architects in the preparation of adequate wiring specifications.

**WOLVERINE LEADER**—State president Wallie G. Campbell of Grand Rapids, claims Michigan's organization activities began at the psychological moment, which is proven by the Wolverine Association's startling growth in so short a time.



STATEWIDE ACTIVITY—Michigan's county organizations now practically cover the State, most of them set up this year.

- 7 To contact manufacturers and wholesalers and power companies on problems of trade relations.
- 8 To influence the building public by distributing information on the best practices in electrical installations.
- 9 To promote establishment of minimum resale prices on electrical devices under Michigan's fair trade practice act.

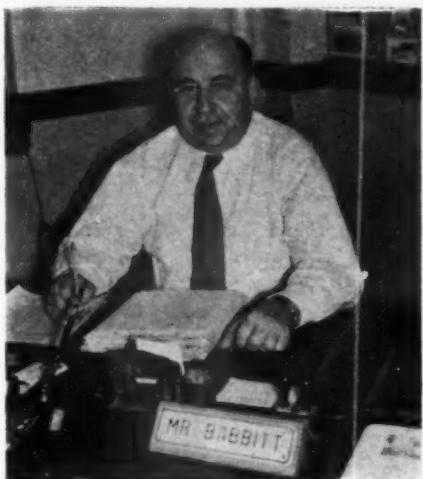
Already the effect of this cooperative effort to raise industry standards has become apparent. Inspectors report a degree of cooperation beyond any previous experience, for instead of sharp shooting at the Code, the contractors are approving and even demanding rigid enforcement.

In a word, the Wolverine State Electrical Contractors Association, as it was recently named, has within a few short months become an important power for cooperation and leadership in that state's electrical industry. Detroit is actively working with the state organization. During the stormy depression years that city had four local contractor associations but a recent merger of two groups now leaves the NECA Chapter, Thomas Edison Club and the Steinmetz Club. All are represented in the state association. Detroit contractors are greatly benefited by a local fair trading policy established by the electrical wholesalers, which has promoted better business relations all around.



**RULE CONSCIOUS**—This Grand Rapids code session exemplifies state-wide interest in inspection and licensing.

**CHIEF INSPECTOR A. T. Babbitt** supervises with a benevolent hand, and gets voluntary cooperation from farmers and contractors.



## Pioneering in Rural Inspection

Michigan has had state inspection for three years, giving to rural communities the safeguards of city dwellers

THROUGH an act passed in 1935, the Electrical License and Inspection Law, the state of Michigan has had an opportunity to demonstrate that rural wiring can be installed and inspected on standards equal to city practice. The facilities set up provide thorough electrical inspection throughout the state, wherever municipal inspection is not available. This legislation has become a model for other states.

The Michigan system operates under the control of the Electrical Administrative Board, a body of six men serving without compensation. The state fire marshal is an ex-officio member.

In choosing district inspectors it was recognized that introducing inspection and charging a fee in communities, where the hazards of improper wiring were entirely unknown, called for education in addition to the actual task of making inspections. The requirements of the job were set high. Ten years practical experience or an engineering school diploma with two years' experience were required, and the inspector must pass a journeyman's examination.

While the program was getting under way a campaign of education and wide spread publicity was telling rural Michigan the advantages to be gained from electrical inspection. Chief Inspector Babbitt, the field engineers, and the district inspectors spoke before farmer groups, contractors and mutual insurance company officers. Newspapers in each new territory announced compulsory inspection. Other articles followed

naming the benefits and telling home owners of the possible hazards already existing in old wiring.

This publicity and the activities of the district inspectors brought in requests from farmers to have their old wiring inspected, which was usually done free of charge. Defects were found which in nine out of ten cases the home owners agreed to correct.

Financing of this inspection program is closely associated with the licensing

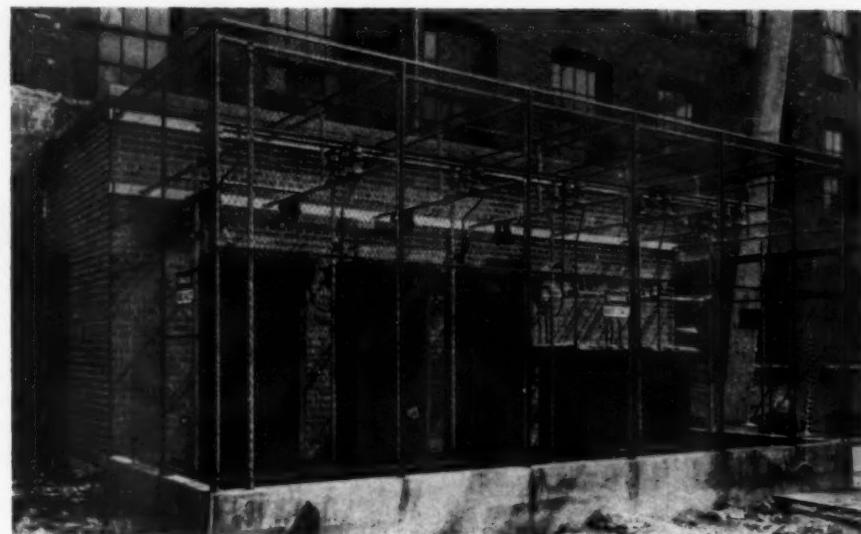
of contractors and journeymen. Under the state law there are two classes of contractor licenses, and also a journeyman license. Class I permits a contractor to operate anywhere in the state and requires a license fee of \$25. In cities with an electrical ordinance and inspection facilities, 50 per cent of that license fee is returned to the city. A Class I contractor may hire an unlimited number of journeymen. Under the Class II license, costing only \$5.00, the contractor may work anywhere in the state excepting in those cities which have a local electrical ordinance. But a Class II contractor cannot hire a journeyman. A Class III license at a fee of \$1.00 is issued to journeymen.

Every effort is made to give a thorough inspection and the inspectors often work long hours. The average time devoted to a single inspection is approximately an hour and fifteen minutes.

The businesslike way in which the Michigan inspectors have built up safeguards against improper wiring has impressed the customers and the contractors alike. Much of the police work that the inspector formerly had to handle by himself is now being done voluntarily by these contractor groups.

Inspection embraces the entire scope of rapid rural development, whether the wiring is done by co-op employees or by independent contractors. Combining also state-wide licensing, the public's risk of employing handy-men is safeguarded in suburban communities as well as on Michigan's farmsteads.

# ADVENTURING in WIRING



**STANDARDIZED POWER**—Sale of primary power to industrial customers involves standardized sub-stations which are installed by electrical contractors.

**TRIAL WIRING**—Pioneering in new types of wiring, a thousand Detroit homes have been wired with CNX cables under trial installation procedure.

**D**ETROIT has long been a proving ground for new ideas in wiring. Some have become standard practice throughout the country. Others are still in the promotion stage. In these developments the Detroit Edison Company has played a prominent part. For example, eight years ago Detroit contractors were installing ranges at a rate of about two a year, at a cost of over \$60.00 each for the wiring. When the market was scanned, utility engineers decided that the high cost of wiring was a difficult barrier to mass sales. A new technique was worked out, cables were substituted for conduit, a new and cheaper cutout box developed, plug receptacles redesigned. Manufacturers were approached to design new materials, the inspector was asked to lend aid in assuring a safe job and the contractors worked up estimates for these installations.

Finally a price of \$21.00 was established for range wiring installations. In May, 1938, 1,745 ranges were installed at an average cost of \$21.00 each for wiring. Today the dollar volume of range wiring averages around \$25,000 per month for Detroit contractors.

Four years ago, the Detroit Edison Company decided to change a part of that city's 450,000 residential meters to the outdoor type. Work orders were issued to contractors by the utility in lots of 20 to 400 meters, to completely modernize a certain street or city square. All meters within a certain area were changed in one continuous operation.

A price of \$5.50 per meter was established. By agreement between contractors and labor, two man hours was set for each meter change. Six men working seven hours made 21 meter changes per day. Contractors supplied the crews with materials and tools in trailers.

## Mass Production Program

Over 150,000 meters have been changed during the past four years, by following this mass production technique. It made possible low-cost meter changeovers and at the same time provided considerable work for contractors.

Detroit also has long been the spear head in promotion of cheaper wiring systems. Back in 1923, two years

before official code approval, non-metallic sheath cable was introduced in residential wiring. Under special permission of the inspection department, 200 of these "Romex" jobs were installed. Official approval followed in 1925, and a new wiring method was added to the Code.

In 1929 another attempt to further simplify and reduce the cost of wiring resulted in the introduction of "concentric bare neutral cables". Again under special permission, some 200 jobs were installed using this new type of cable. This type of wiring system however, has not been approved by the National Electrical Code.

The search for a cheaper wiring system went on. In January of 1937 a promotional campaign was built around the new protected neutral cable, popularly known as CNX. Under the name of Trial Installation Cable it had been tested by the Underwriters' Laboratories and temporarily listed for "trial installation".

The inspection department permitted a specified number of jobs under rigid trial installation procedure. In connection with this campaign a sub-feeder layout was also designed to encourage the use of higher copper capacities and greater adequacy. Over 1000 trial installations have been made to date, and permission granted for some 500 more. Although this new material was not adopted in the revised 1937 code, Detroit Edison engineers

(Continued on page 96)



*DETROIT SHINES—with electricity by night and bums with it by day. You will see the great automobile shops and much advanced electrical practice.*

# MEAT for Contractors

Good Stuff in the Detroit Convention Program — Four Days of NECA Meetings Offer Valuable Experience

A LITTLE study of the program of the 36th Annual Convention of the National Electrical Contractors Association to be held in Detroit, September 12 to 15, builds up a strong appeal. It offers not only the annual gathering of electrical contractors from all over the country, for contact and the exchange of experience. It presents also a scope of discussion worth any man's time and attention.

Two high spots stand out. On Monday afternoon for the first time the head men of the Rural Electrification Administration, from Washington, are meeting with a national convention of the electrical industry to talk things over. John Carmody, the Administrator, Warner Pyles, head of the Wiring Section and Henry Brite, who runs the EHFA Plan to finance wiring, will be there. They will discuss rural line construction, rural wiring, inspection and financing. Then a conference period is set apart for contractors and REA.

With \$100,000,000 to be spent now, this REA work is about the biggest thing in the electrical construction picture. Whether you are doing this work or not, it affects you. You should understand it. You should know the men behind it. Well, here they are!

Another innovation—a morning to

review new developments that will be offering new opportunity to the contractor this season. Experts will present a selected group of equipment features and discuss major developments that loom large in your work. Here is a chance to listen, to ask questions, to find out.

Every indication promises a fine convention, for Detroit is an ideal convention city. The preceding pages present its features of special import to us. The entertainment program is rich in interest. Also the trip will be memorable from the standpoint of enjoyment as well as good for your business. Here is meat for contractors—cake for the ladies. Let's all go!

## Program of NECA Convention

*Detroit, Sept. 12th to 15th*

### MONDAY, SEPTEMBER 12

#### "Who Benefits from REA?"

John M. Carmody, Administrator, Rural Electrification Administration.

#### "Wiring the REA Homes and Farms"

J. Werner Pyles, Head of Wiring Section of REA, Washington.

#### "The EHFA Wiring Financing Plan"

Henry D. Brite, Commercial Manager, Electric Home and Farm Authority, Washington.

- "The Dollar Value of Apprenticeship" William F. Patterson, Executive Secretary Federal Committee on Apprentice Training, Washington.  
"Voluntary Agreement of Fair Competition", D. B. Clayton, Birmingham.  
"Fair Buying and Fair Selling" Ralph M. Walker, Atlanta.  
"Your National Association" Laurence W. Davis, New York.

### TUESDAY, SEPTEMBER 13

#### "Industrial Electrification"

Frank M. Hydon, Detroit, President Hydon-Brand Co.

#### "Handling Range and Water Heater Installations by Mass Production"

P. M. Geary, Youngstown, Manager, Steel City Installation Co.

#### "Fair Competition in Bidding Practices"

W. T. McAuley, Kansas City, Mo., President Greater Kansas City Chapter, NECA.

#### "Industrial Cost Plus Jobs"

W. A. Millen, Windsor, Ont., President Millen Electric Co.

#### "Greeting from Our Canadian Neighbors"

James H. Turvey, Brantford, Ont., President Ontario Electrical Contractors Association.

#### Visit to River Rouge Ford Plant Golf Tournament

### WEDNESDAY, SEPTEMBER 14

#### Open Forum on Opportunities Ahead

Checking Power Factor

What is an Explosion Hazard?

Protective Electronics

Sterilamps and Sterilizing Devices

Silent Switching

Fluorescent Mazda Lamps

Mercury Vapor Lamps

Machine-light Transformers

#### Union Shop Section

#### Annual Banquet

### THURSDAY, SEPTEMBER 15

#### "Pricing Time and Material Jobs"

William Hazel, Cleveland, O.

#### "It Costs Less to Live Better"

C. M. Ripley, General Electric Co.

#### General Forum Hour

#### Election of Executive Committeemen

# Planned

Fresno's New Civic Auditorium Shows What Public Buildings Need to Make Them Electrically Modern in Keeping with Lasting Construction



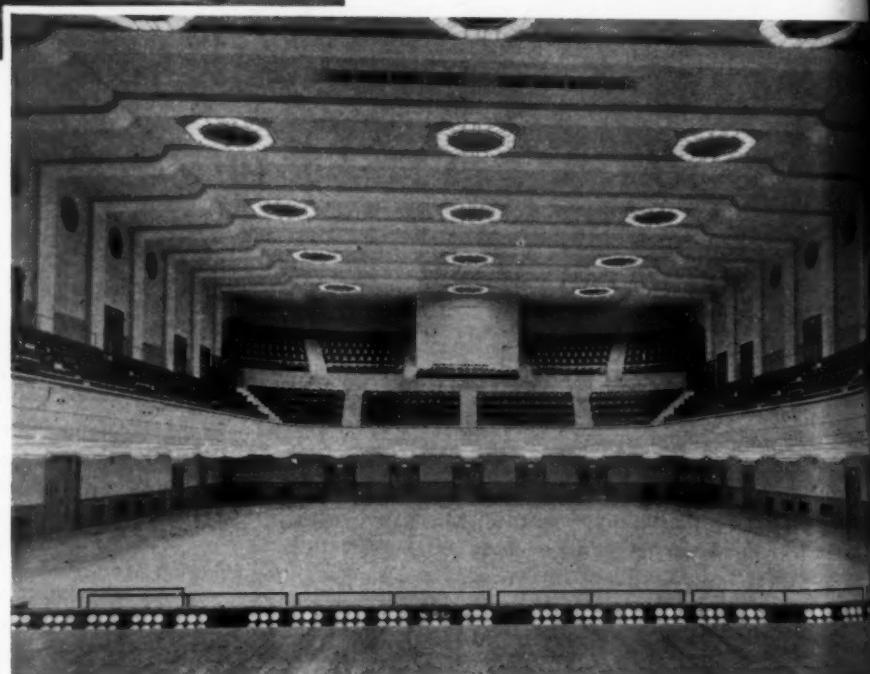
AUDITORIUM EXTERIOR has loud speaker outlets on roof for handling overflow meetings, also outlets for future flood lighting.

By L. G. Jeffrey

Electric Construction Company  
Fresno, California

**C**ONTRACTORS may think there is no way of influencing what goes into a municipal building, but you'd be surprised what you can do if you try. For no public building like that starts without a lot of preliminary talk and discussion. In Fresno we started talking about a new civic auditorium three or four years before it was actually started.

As soon as you first hear that such a building is being planned, then is the time to start working on it, to see that it will be as up-to-date tomorrow as it is the day it is opened. We contractors of Fresno were fortunate that way. Through the San Joaquin Light & Power Corp., we have available an engineer who goes to work for us with the architects of the city. When Carl F. Wolf gets through talking and planning with the architect, describing all the possible uses the building may have for electricity tomorrow and during the next 20 years, we really get a fine electrical job. As a result the city has a building that won't grow old, and the public has a plant that will fit in with any sort of show, celebration, fair or athletic event. A civic auditorium must be versatile. You don't want to



AUDITORIUM ADEQUACY includes facilities for exhibitors, spot lights on the balcony front, spots which can be trained from ceiling posts, and a center unit equipped for adequate prize ring lighting.

tear the floors up or the walls down to get all the facilities you need for any type of occasion.

So this won't be just a story of an exceptional electrical job. Rather it carries a list of suggestions that contractors in other cities can make to those who are planning a civic auditorium. Here are the ideas we sold to the city of Fresno.

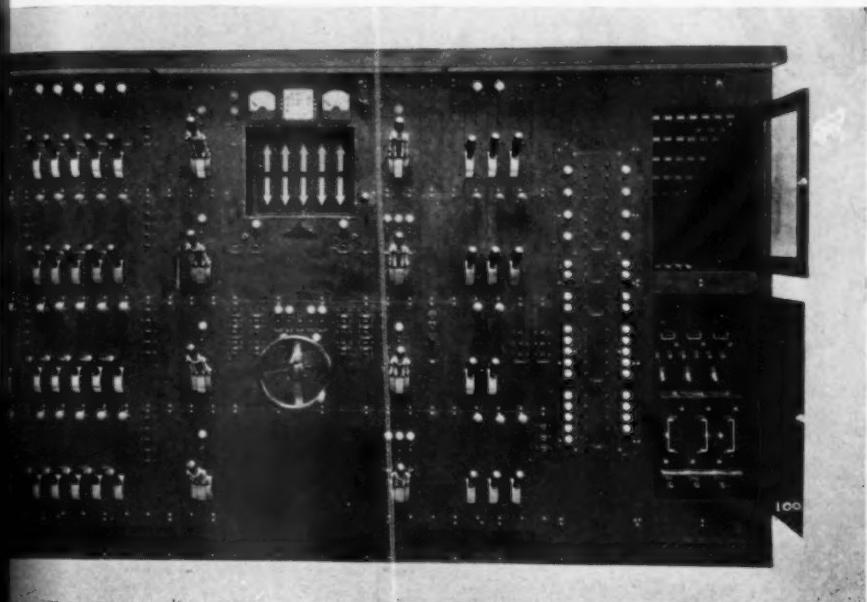
**1** Buildings used for large public meetings need a high grade public address system. It should be flexible so that it can be used from the stage, from the floor, from the center of the floor for a boxing ring, from the front

steps outdoors for parades and civic outdoor events, or to bring the sound of interior events to overflow crowds on the outside, or into several of the committee rooms.

**2** The auditorium will be used for big shows—auto shows, food shows, electric shows. For these it needs facilities to serve power to individual booths and exhibitors, meter them separately and do so without running cables over the floor to be tripped over or damaged.

**3** When used for large social events such as dances and parties, the lighting

# for TOMORROW . . .



MAIN STAGE BOARD has ten lighted prompter arrows at the center, each with colored lamps behind opal glass, corresponding to colors in borders or footlights.

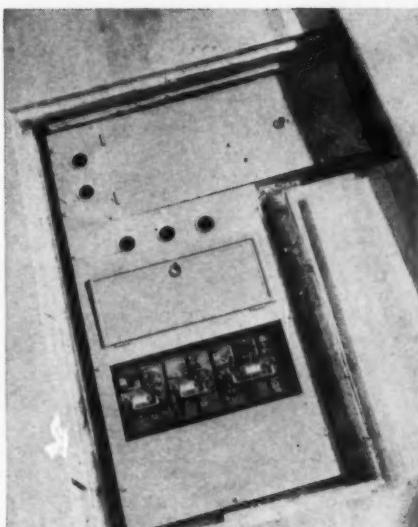
must be susceptible to control so that soft and colorful effects can be produced.

**4** For big athletic events, either covering the entire floor, or in a concentrated boxing or wrestling ring, a high intensity of lighting is needed over the center. Sound and telephone facilities, also, should be provided from the center of the main floor for the press and radio.

**5** When the auditorium is used for conventions, it requires sound for the main auditorium, with connections to important committee rooms. It requires lighting facilities for a variety of purposes—exhibits, stage presentations, lectures.

**6** The auditorium is also used for operas, theatrical performances, amateur or local performances, moving pictures and pageants. For these purposes a flexible and ample stage lighting and moving picture booth equipment is required.

**7** A large building of this kind needs adequate lighting facilities for cleaning



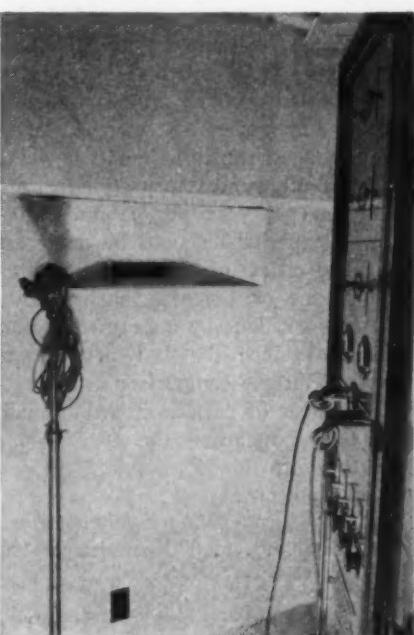
UNDERFLOOR PANEL in center of auditorium for exhibits also provides telephone and public address system connections. Cables from side walls are unnecessary.

up after performances or shows, controllable from each of the normal entrances to the auditorium to avoid stumbling around in search of lighting switches. This calls for switch control of a portion of the white lighting from the stage, from the main vestibule near the front entrance, from the projection booth, from the attic over the auditorium ceiling and from the entrance to the auditorium at the rear.

The accompanying illustrations show how such facilities were provided in the Fresno civic auditorium. It will be noted how access to power supply for exhibits is furnished by installing wall and center-of-the-floor utility cabinets. The sound system was worked out so that it can be used in almost every possible combination. Conduit was run for future floodlighting which is to be installed after shrubbery has grown. Even this floodlighting can be separately metered. Also, there are facilities to limit the amount of current supplied with the rental of the auditorium, and to submeter any extra use.

While such an electrical installation absorbs a larger percentage of the building appropriation, it proves an ultimate economy to the city in that maintenance will be less, revenue derived from rentals will be better, obsolescence of the building will be slower, and expensive additions and changes to make its facilities modern will not be necessary for years. On this basis it can be sold, even if it does take hard work to do so sometimes.

PUBLIC ADDRESS CONTROL room port gives operator a view of the entire auditorium. The system can be used outside or anywhere in the auditorium, or on the stage.



# THE COST OF *Safety*

**Survey of Inspection Departments Shows**

**Annual Cost of only 7 cents per capita**

**H**OW much is it worth to inspect wiring? This means to inspect new jobs, re-inspect thousands of old jobs, conduct license examinations and perform many other important functions which effect the safety of electricity users in our typical cities. The average cost per year is only seven cents per person in twenty-eight larger cities. These costs have been deduced from the detailed operations statements published by the International Association of Electrical Inspectors.

The figures, shown here, cover 1937 operations, except for four cities, and apply to 16,635,300 total urban population in seventeen states. The cities range in population down to 170,000. The average per capita cost is based on reported total revenues for each city. Operating costs are not given.

For all cities shown there was an average of 20.2 permits issued during the year per 1000 population. The total revenues of \$1,188,694 and 336,667 permits reported provides an average revenue of \$3.52 per permit. The most accurate comparison to be made, however, is in the number of inspection permits taken out per year per capita. Some allowance perhaps should be made for industrial cities in which one permit is issued once or twice a year to cover all the work done by a licensed factory electrician since the last permit was issued. But the comparison is fair.

In number of permits issued annually per 1000 population the four leaders and the four lowest ranking cities of this group were:

*Highest Total*

Portland	67.2	permits per 1000
Los Angeles	43.0	" " "
Grand Rapids	65.0	" " "
San Francisco	28.3	" " "

From this it is obvious that many cities are not providing enough revenue to operate their inspection departments. There is either a general laxity in taking out permits or the fees are not in balance with the amount of construction work going on.

Finally, the reported revenues compared with permits issued during the year indicate a wide difference in average cost. While the average revenue per permit for these cities is \$3.52, here are the four highest and the four lowest ranking cities:

*Highest Cost*

Chicago	\$7.00	revenue per permit
Kansas City	6.05	revenue per permit
Pittsburgh	4.72	revenue per permit
San Francisco	4.05	revenue per permit

*Lowest Cost*

Houston	\$0.32	revenue per permit
Hartford	.93	revenue per permit
Syracuse	1.59	revenue per permit
Portland	1.60	revenue per permit

	<i>Lowest Total</i>
Pittsburgh	4.7 permits per 1000
Cleveland	7.1 " " "
Buffalo	7.9 " " "
Toledo	9.9 " " "

In *revenue per capita*, the four leaders and four lowest ranking cities were:

*Highest Revenue*

Los Angeles	\$0.16	per capita
Kansas City	.15	per capita
San Francisco	.115	per capita
Chicago	.113	per capita

*Lowest Revenue*

Houston	\$0.057	per capita
Hartford	.017	per capita
Cleveland	.0185	per capita
Buffalo	.0189	per capita

Here then is a guide for industry leaders in every town. If your community needs more re-inspection activity, better service on new jobs, greater attention to investigations of fires and electrical injuries, it calls for increased facilities. If the public expense is too small to allow your inspection department to operate effectively, something should be done about it. And the first step is reliable comparative data.

INSPECTION OPERATIONS IN 28 CITIES				
	Population	Total Revenues	Permits Issued	Permits Per 1000 Population
Chicago	3,500,000	\$398,000	56,850	16.2
Detroit	1,800,000	91,225	30,535	16.9
Los Angeles	1,300,000	209,000	55,913	43.0
Cleveland	913,771	16,843	6,512	7.1
St. Louis	850,000	43,263	16,376	19.2
San Francisco	746,000	86,193	21,172	28.3
Pittsburgh	670,000	15,163	3,141	4.7
Buffalo	650,000	12,250	5,126	7.9
Milwaukee	624,243	16,497	8,463	13.6
Kansas City	500,000	76,050	12,548	25.0
Minneapolis	495,000	22,754	11,248	22.8
Houston	410,000	2,359	7,481	18.2
Louisville	326,000	8,067	3,960	12.1
Portland	320,000	34,406	21,568	67.2
Columbus	315,000	13,716	8,150	25.4
Denver	305,000	18,688	6,655	21.1
Oakland	304,000	16,259	7,665	25.0
Toledo	287,625	7,836	3,015	9.9
Memphis	283,835	12,798	5,345	18.6
St. Paul	275,000	12,895	7,275	25.7
Atlanta	250,000	17,813	7,102	25.8
Akron	228,000	4,800	2,900	11.6
Oklahoma City	225,000	12,153	4,725	18.1
Syracuse	200,000	4,956	3,122	13.9
Fort Worth	185,000	7,469	3,573	18.6
Hartford	182,000	3,075	3,299	17.8
Youngstown	170,000	5,523	2,498	13.7
Grand Rapids		19,003	11,050	65.0

THE UTILITY sees it in terms of good will maintained, service needs eliminated.

BUILT TO SERVE ALL FOUR

This is  
YOUR Answer

THE WHOLESALER sees it in terms of merchandise to be moved.

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SERVICE CONTROL



THE CONTRACTOR sees it in terms of work eliminated but satisfaction created.

THE HOUSEHOLDER sees it in terms of attractiveness, safety and simplicity.

At work in one field for more than 45 years naturally penetrate to a greater depth, a better solution of problems. That's the story in simple terms behind Cutler-Hammer's Engineering Leadership . . . behind the knowledge that makes C-H Service Control what it is today. Regardless of the problem, regardless of whose need is at stake . . . Utility, Contractor, Wholesaler or Householder . . . Cutler-Hammer Service Control meets that need in greatest measure. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturer, 1306 St. Paul Avenue, Milwaukee, Wisconsin.

See the new Cutler-Hammer Designs in Booths 21 and 22 at the National Electrical Contractors Association Convention, Book-Cadillac Hotel, Detroit, Michigan, September 12 to 15.

CUTLER-HAMMER SERVICE CONTROL  
comprises a complete, satisfying range of equipment for every purpose in the domestic consumption of electricity. Among the line you find such outstanding units as:



C-H Multi-Breaker  
Most modern of this type of equipment. Fool-proof, safe, economical, convenient from every standpoint.

The New C-H Tri-Branch Fuser  
Exclusive C-H, 3 fuse-protected circuits for each unit, economical means of adequate wiring. Small, attractive, easy installation, builds loads and business.



C-H Fuseless Main Switch  
Hailed as the greatest single contribution to service control, offering a host of advantages. C-H No. 4334H17.



C-H Cover-Operated Main Switch  
Removable interior, dead front, easy installation. In fact, every wanted service control feature. C-H No. 4331H7.



# Editorials

Earl Whitehorse, Editor

## Why Must We Fight

Like the autumn leaves that soon will fall upon our countryside, a shower of Code resolutions is fluttering down upon the electrical industry. Several state inspection groups have already condemned the proposals of the power companies to radically revise the National Electrical Code. Other I A E I sections, we learn, will register disapproval. N E C A delegates may also have something to say in Detroit.

It is a simple situation but a trying one. Power company men are focused on forcing cheaper wiring. Inspectors see themselves as the appointed defenders of the public safety. Neither will budge. Electrical contractors look on and usually side with their personal friend, the inspector, because they think along the same lines and refuse to reduce construction standards.

So it is all a matter of mixed opinions. Yet the issue must some day be solved on a basis of facts—engineering and mechanical. Nobody's opinion can settle it. Meanwhile the whole industry is embroiled and embittered. A 20-year-old controversy grows hotter. It will only stop when all sides cool down, willing to find out cooperatively what should be done.

## The Scandal in New York

The sorry scandal in which so many of the leading electrical contractors of New York City—guilty or not—are involved, does not make pleasant reading. Because no direct indictments and no trials have yet proved guilt, every contractor named in this case is entitled to sympathy and should be held clear of suspicion. For that reason, and because it is a local affair, little has been said in these columns.

But when the *Saturday Evening Post* ran a half page editorial about it on Aug. 6, it could no longer be called local. It became—it was already—national in its bad influence upon our industry, by its implications. The *Post* demanded that the alleged conspiracy between accused Local Union No. 3, the 40 odd contractors and the 29 manufacturers to boycott all products not under local protection, be prosecuted and carried speedily to the United States Supreme Court. Every honest electrical contractor, manufacturer and union workman must endorse this call, if he wants America to stay a free country of free men.

The recent sentencing of several contractors on collateral charges of perjury or income tax evasion is disturbing but should not be permitted to confuse the mind. So far there are no direct indictments under the complaint. No trials have been held. But the electrical contracting industry is stricken over the growing cloud of hurtful publicity and prays for an early and an honest trial. Let the facts fall where they may.

## Inciting Invasion

Rural line jobs attract many bidders. Worse than that, they lure an increasing number of non-electrical firms. Pipeline contractors, bridge builders, paving contractors, and others are in the competition, getting wisdom the hard way.

Uncle Sam does the engineering, bonding companies write the surety, electrical wholesalers and manufacturers provide material estimates, and even assist in figuring the labor. Consequently experienced line construction contractors are being nosed out by experimenters.

Who will finally pay for this expensive education in line construction? The farmer! This encouragement of gambling on the part of inexperienced

men power by the active assistance of suppliers is all wrong. Rural line construction lies in the category of electrical work, and if there are experienced electrical contractors available to do the work they ought to do it. If they are not available, it is certainly big news.

## And What's More—

It is an amazing thing the way the scent of a few dollars will demoralize this industry at times. For fifty years we have been building up a system of distribution, educating specialized men to install electrical work. But though we contractors are large buyers in the mass, the majority work locally as individuals. Now these suppliers brush all this aside in the vain hope of creating a new kind of customer in this rural field.

It is a fair bet that if the contractor could speak with a united voice, he could talk to both electrical manufacturer and wholesaler and sound like more dollar volume, than these outside bidders. And the crutch would be withdrawn. It is about time these things were said by many contractors as customers.

## Peach Fuzz Begone

Well, we have another market—defuzzing peaches. Georgia peaches are now being de-furred, ready for the table. Machines with revolving rollers keep the fruit turning while high-speed brushes whiz over the fuzzy surface. It looks as though the electric razor boys better watch their step. These peach un-fuzzers do a quick job on a mighty tender skin—and fast.

## Get 'em Talking It!

The first editorial in the Seattle *Journal of Commerce* recently was titled "Leaking Wires". It told how voltage drop spoils the brilliance of light, the speed of cooking and wastes money. Sam Hepler gave them the facts. They thought it was interesting and urged their readers to see that their wires were big enough.

Now aint that sumpin? If you can interest a newspaper, you can interest a householder, a merchant, a manufacturer. And have you told your newspaper? Why not? And are you telling everybody else?

## More on Michigan

While we're in Detroit at the convention—another bit of news. Consumers Power Company, serving widely in Michigan has just liberalized its rural line extension policy. More straws in the breeze.

The company now has 12,000 miles of rural lines, with 50,000 customers. Formerly no lines were built for less than five customers per mile. Now they ask that each mile guarantee a monthly revenue of \$12.50 per mile per month. One farm, two farms, three farms, O.K. And why not? It's the money that counts.

Make no mistake, rural business will loom large for contractors from now on. It offers lines, interior wiring, motor sales and service. It's our meat.

## Dress 'Em Up

Ten years ago your car was serviced by a grease monkey in dirty overalls. Today a snappy looking attendant in a neat uniform does the job. The big chain service stations dressed up their men because it paid.

Your electricians get into factories, offices, stores and homes. They are regularly in contact with your customer and his employees. Yet, the chances are, they are on the job in old clothes and overalls—highly skilled mechanics, unidentified and indistinguishable from casual laborers.

Take a tip from the gas station man. Overalls may once have been a badge of honest labor but today you gotta have "umph".

## Why Bugs Can't Resist

Scientists tell us that "phototropism" is the strange phenomenon which gives insects the urge or muscular reaction to fly to a source of light. Incidentally that is also our sales cue for good window lighting. Looking into this business with a practical eye for business, the magazine *Timely Ideas* recently explained how industry fights insects electrically. From pest ridance in a Moroccan tobacco factory to cutting losses of dried fruit in a California plant, from apple orchards in New York State to insect-attracting traps used to feed trout in a fish hatchery, it all points out new ways to save losses. In handling organic products the bug problem may be

present to some degree. So get out your "Things to know about Entomology" and check up on which bugs you want to slay.

## A Church Steps Out

A fifty year old church in Chicago has just installed an air conditioning system. It is an idea worth studying. The purchasers have fought a long battle for attendance. Motors, movies, radio and rest are drawing bigger crowds. The church, so far, has done little to offer a modern competition in terms of comfort to the congregation.

There is a leader among the clergy in every city who is trying to face this problem. Discuss air conditioning with him. Show how he can make his church inviting in summer and more healthful the year around. It means a major installation and more churches to follow.

## Path O' Light Deluxe

Sooner or later some one was bound to go beyond the much-recommended "path of light" switching layout. Now we have it in the Westchester Lighting Company's new Home for Better Living in White Plains, N. Y. Here the layout includes small recessed units near the floor that flood the passages throughout this fine demonstration home.

Here's another plus item which will enhance advanced design, cultured living and excellent taste. Jot it down.

## Back Talk

### Vigilantes Needed

To the Editor—I want to congratulate you on having the intestinal fortitude to print the editorial "Behind the Beard". It seems to me most business men take a fatalistic attitude toward vicious local situations instead of trying to do something about them. However, you have pointed out that such situations can be remedied most effectively by any group of men who are willing collectively to fight for the principle involved.

As I see it, you have revived and applied the vigilante principle of 50 years ago to an economic situation. Your suggestion, intelligently carried out, will be most effective.

R. D. Horning, Manager,  
Seattle Electrical Contractors Ass'n.

You have said it better than we did, Mr. Horning. Thanks for your endorsement. The whole question is—why should men wait, who are ready to go forward? Life is not organized that way and why should we hold back the entire industry to please the stragglers?

## Suggests Regional Inspector

To the Editor—I am a journeyman-contractor in a part of Connecticut where there seem to be few contractors who, judging by their installations, know of the existence of the Code. I heartily wish that an inspector could be installed for a number of surrounding towns, similar to the regional high school plan. At present we have no inspection at all.

Harry I. Lowndes,  
Canaan, Connecticut.

An unfortunate situation, to be sure. Here is an example that could be repeated in endless numbers throughout many states. It means a big job for some years before universal Code enforcement will be realized. In the meantime an innocent public uses tight wires, and in many cases "haywire," for lack of proper inspection.

## Progress Helps All

To the Editor—Your editorial, "Build a Ball Team", in my opinion hits the spot. While I have tried for many years to include the entire industry in all promotional campaigns, I know it is not possible to get full coverage especially in larger cities. And when you can get the good men, big or little, who will play the game, these good men themselves do a job that promotes the interests of the others. Then those who are trying to get a free ride, will want to "keep up with the Joneses" and help make the industry bigger and better not for a few but for all.

A. Lincoln Bush,  
New York.

This is true. If the men who want to go ahead will work together and forget the laggards, the whole industry benefits from whatever is accomplished. And each time it may open the eyes of one more laggard and he'll get religion. So why hold on?

## Voltage Drop Gadget

To the Editor—I have just read the July article "I Check Voltage Drop and Sell Wiring." You are exactly correct in your viewpoint. It happens to be an old hobby of mine that the electrical industry as a whole is not doing a good selling job; particularly the contractor, the repair and service shop, and the supply section of the industry. Therefore, I hope you will run more of such articles. I am making a note of this for a paper at the next N.I.S.A. convention on the question of selling in our industry.

J. E. Launder, Kansas City, President,  
National Industrial Service Ass'n.

Thank you, Mr. Launder. To us the idea is basic. Because the country is full of under wired buildings—commercial, industrial, domestic—now suffering from voltage drop, it would seem that the first thing to do is to show the consumer what he is losing by it. And because it offers opportunity for a dramatic demonstration, it is good selling.

We are glad you approve and we will continue to promote this plan. In fact, we have some improved gadgets now under field trial.

## Voltage Drop Selling

To the Editor—I have read with keen interest Wolf's article on Voltage Drop. This seems to vindicate your notion that some people thought cock-eyed. Wolf is apparently making a great contribution.

H. J. Mauger,  
Chicago.

We think so. And the opposition to sell wiring by the voltage drop approach does not discourage us. It takes time for every new idea to be accepted, every suggestion of a different approach than that of the existing habit. Some power companies fear any discussion of low voltage lest the public misunderstands voltage fluctuation entirely and make trouble. But there is no danger to be feared, once the recommended approach is followed. This will gradually become apparent and objections will cease.

# Better Lighting

## Selling Light to Gasoline Stations

### Layout Equipment and Intensities To Use

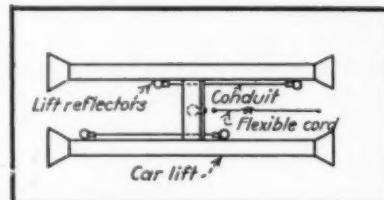
In the course of a single year thirty million automobiles and trucks in the United States bought 20 billion gallons of gasoline from 200,000 filling stations. Total retail sales amounted to two billion dollars. That, in round figures is a picture of the filling station's annual business. The share of each filling station in this business is conditioned by a number of factors: location, accessibility, volume of passing traffic, density of competition, and last, but far from least, lighting.

The average filling station operates on a 16 to 18-hour a day schedule. Adequate artificial illumination to perform the number of services that the automobile driver has grown to expect from his corner filling station is therefore a vital necessity. But even more important than this, lighting plays a vital part in bringing the customer to the station after the sun goes down.

The electrical contractor has an op-

portunity here to sell better lighting. In the new station he must be equipped to recommend and install lighting equipment that meets modern illumination standards. In the older station he must be equipped to replace obsolete and inadequate lighting equipment.

To approach your prospect with concrete ideas apply the following recommendations and principles, illustrated in the accompanying diagram, to his station:

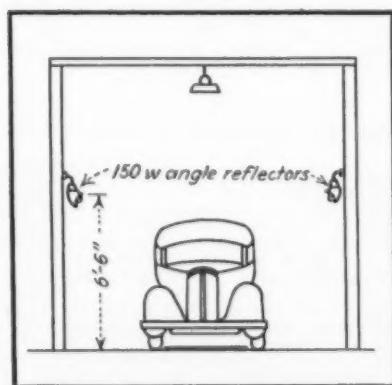


*WASH RACK lighting requires closely spaced reflectors arranged for even illumination of car bodies.*

### Floodlighting

The illumination of the lot, and spot-lighting the pumps and building to attract attention is the function of the border floodlights. The illumination intensities required will be determined by the surrounding lighting to some degree. For instance, a bright, well lighted business district will require higher levels than a residential neighborhood. Under average conditions five foot candles for the lot and drives, and 20 foot candles on pumps and buildings, will provide effective illumination.

Floodlights must be mounted at least 20 feet high, adjusted to provide even illumination over the lot, and concentrating at the building.



*LUBRICATING LIFTS require supplementary illumination from below. Small reflectors bolted to the track make a neat permanent installation.*

### THE GAS STATION LIGHTING MARKET

Whether in the big city or at the country crossroads, gasoline service stations are a prominent feature of the American landscape. This is because they operate by night as well as day. Therefore, no other industry is more widely conscious of the value of modern lighting.

What was the best in lighting ten years ago is not enough for this industry today. Keen competition prevails. Business follows the light. In your community there are many opportunities to build new business by bringing the lighting of the corner gas station up to date.

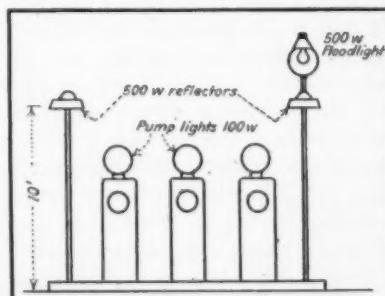
### Pump Island Lighting

The area surrounding the pumps is the workshop of the service station and requires adequate illumination intensities to permit quick, efficient service. Intensities of 25 foot candles are recommended for this area. Reflectors for mounting on posts at the island are available which are particularly designed for this service. Equipped with 500-watt lamps at 10 foot mounting height, and spaced not over 16 feet apart, these units will supplement the general floodlighting by adding 17 to 20 foot candles at the 30 inch working height.

Additional floodlighting on the building may be provided by small diffusing floodlights mounted on top of the island lighting units.

### Station Office

General lighting of 20 foot candles from indirect or semi-indirect units is



*PUMP ISLAND lighting must permit fast and efficient service. Pole top reflectors provide the necessary high intensities in the working area.*

**GOOD LIGHTING FOR THE GAS STATION**

**Recommended layout Showing the Location of Outlets, type of  
Lighting Equipment and Intensities of Illumination Required.**



recommended for the station office. Show windows should be provided with 150 watt reflectors spaced on 12 inch centers or equivalent lighting equipment. If window reflectors are not screened from view inside, reflectors should be equipped with louvers to avoid glare.

The customer's waiting room adjoining the lubricating lifts requires intensities adequate for reading or writing. Indirect or semi-indirect illumination of 20 foot candles is recommended.

#### General Repairs

Brake testing, wheel alignment, ignition repairs, tire repair, carburetor adjustments and similar maintenance services performed by the service station require adequate general lighting with supplementary lighting for the difficult seeing tasks. For general lighting, high quality reflectors providing 15 foot candles are recommended. Drop lights or adjustable arms providing 50-foot candles of illumination on the working plane should be provided at the bench.

#### Lubricating Lifts

Air or electric operated lifts have almost eliminated the "grease pit" for routine lubrication work. Good under-chassis illumination is still required, however, to supplement the general lighting. Compact reflectors which fasten to the lift track and direct light up underneath the car, provide a convenient method of underchassis illumination. Other methods include portable reflectors specially designed to withstand severe mechanical abuse, and lighting units with heavy glass covers set flush in the floor.

General lighting for the lubricating area should provide a minimum of 15 foot candles. RLM reflectors with silver bowl lamps or glass-steel units are recommended to avoid glare.

#### Wash Rack

Uniform lighting of the car body with lighting units protected from moisture are the major requirements

### WHAT TO INSTALL

RECOMMENDED INTENSITIES AND LIGHTING UNITS FOR THE SERVICE STATION

Location	Foot Candles	Type of Unit
Lot and Drives ...	5-10	Flood-lights A-1000 w
Building ....	20	Pole top reflector B- 500 w
Pump Island.	25	Pole top reflector B- 200 w
Air Island... Station Office ...	10 25	Semi-Indirect C- 300 w
Waiting Room ....	25	Indirect C- 300 w
Utility Room ....	10	RLM Dome D- 200 w
Lubrication.. Wash Rack	15	RLM Vapor Proof H- 150 w
Car Lift....	...	See detail E- 60 w
Bench drops.	50	RLM Dome D- 200 w

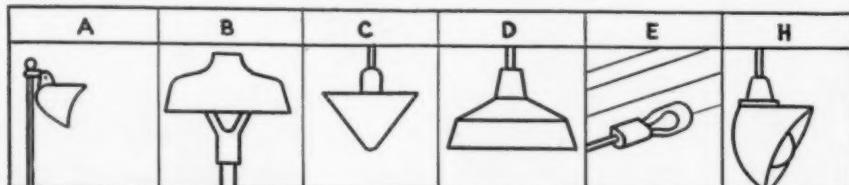
in the wash rack. Vapor proof angle reflectors with 150 watt lamps, mounted along both sides, 6 feet, 6 inches above the floor, 4 feet apart and 5 feet distant from the body, will provide an even spread of light of adequate intensity for efficient work.

#### Utility and Wash Rooms

The compressor and heater room requires only enough illumination for routine care of the equipment. A lighting intensity of 10 foot candles is adequate for this area. The same recommendation will be satisfactory for the tire and storage room.

Service stations in recent years have set up high standards of cleanliness and convenience in customer's wash rooms. The lighting equipment should be on a standard equal to the plumbing fixtures. A center fixture consisting of a porcelain or enameled ceiling unit with 100 watt diffusing glassware and 60 watt side brackets at the mirror is a minimum standard.

The accompanying diagram and detail sketches illustrate a typical gasoline service station with these recommendations applied to the lighting installation. Equivalent results in stations of different design may be obtained by applying the same principle of layout; mounting heights, wattages, spacing and fixture types, as those shown.



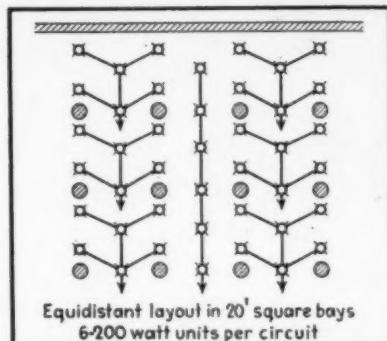
PICTORIAL INDEX to the above table

26 pages 27-28 omitted from all copies of this issue.

### EQUIDISTANT SPACING

Staggered rows of lighting units can frequently be used to provide more even distribution of light in factory areas. The usual practice of lining up machines and material stocks in orderly rows in line with the columns often creates "blind spots" or heavily shadowed areas when "square" layouts of four lighting units per bay are used. This method of course, is usually the most flexible from a circuit grouping standpoint.

One solution of this problem, used by the A. C. Electric Co. of Milwaukee



SIX LIGHT groups with equidistant hexagonal spacing give the same length of runs between outlets.

is shown in the accompanying layout sketch. With this arrangement any group of six lighting units forms a hexagon and the staggered rows are provided with practically unlimited circuit grouping possibilities.

The outlets are exactly the same distance apart, as any layout uses the same length of conduit run between outlets, so these lengths can be made up in quantities ahead of time. The equidistant spacing of lighting units also provides an even distribution of illumination in the finished job.



STANFORD FIRMAMENT—Here are 226 built-in Holophane lighting units at Leland Stanford University's new Memorial Theatre—an experimental laboratory of the theatre. This pattern arrangement employs units ranging from 40 watts to 200 watts, controllable in five groups. The main floor may be lighted to a uniform value of 20 foot candles. Lighting units have individual removable boxes and are plug-connected to wiring strip in the suspended ceiling space, for easy removal of lamps and general maintenance.

## GROW WITH YOUR JOB

SINCE beginning this series, the constant aim has been to sift out non-essentials, and give busy maintenance men only the "meat". A constant growth of electrical applications and associated maintenance problems requires a corresponding growth of maintenance and application knowledge. These background articles can help you keep in step with this progress.

Consider the current article in this series, for example. Here is discussed special control equipment, that is being applied in ever-increasing numbers. Maintenance men must keep abreast of its widespread use, know what fundamental principles govern its functions, and learn how to organize for keeping such controls in fit condition.

This series of articles began in January with a frank review of the electrical maintenance man's job. Then came—

1. ALTERNATING CURRENT MOTORS—Types and Applications
2. DIRECT CURRENT MOTORS—Types and Applications
3. ALTERNATING CURRENT MOTORS—Maintenance
4. DIRECT CURRENT MOTORS—Maintenance
5. A.C. MOTOR STARTERS AND CONTROLLERS—Types and Applications
6. D.C. MOTOR STARTERS AND CONTROLLERS—Types and Applications
7. MAINTENANCE OF CONTROL EQUIPMENT
8. SPECIAL CONTROL PROBLEMS—Heavy Installations and Maintenance (this issue)
- Coming articles will discuss—
9. ELECTRIC DISTRIBUTION—Circuit protection—Power Factor Correction
10. LIGHTING—Applications and Maintenance
11. ELECTRIC HEAT—Types, Applications and Maintenance
12. ELECTRIC WELDING—Types, Applications, Control
13. INTERPLANT COMMUNICATION—Types and Common Maintenance Problems
14. INSTRUMENTS—Types, Application, Care
15. POWER TOOLS—Types, Application, Care
16. BATTERIES AND RECTIFIERS—Types and Maintenance
17. ELECTROPLATING—Maintenance Aspects
18. ELECTRONIC DEVICES—Types and Applications

# Electrical Maintenance

## Special Control Problems

### Heavy Installations and Maintenance

CONTROL for special applications is always more complicated than that for the average motor drive. For many heavy installations the control is required to operate motors in a definite sequence, and occasionally at unusual overload conditions. Also special duty cycles are employed for short periods to meet emergency demands.

For such applications it is important that maintenance men and plant engineers be entirely familiar with the purpose and design of the entire equipment. Complete knowledge of the apparatus will often enable maintenance men to discover and correct conditions that might eventually cause serious delays or accidents. The effect of erratic operation of control equipment may first be noticed on a driven load and eventually be traced to its source on the controller.

#### Control For Wound Rotor Motors

When speed control is desired for a.c. installations, the wound rotor motor with secondary resistance is generally used.

To control speed the secondary resistance is adjusted by magnetic contactors controlled from a master switch. Automatic acceleration is obtained if the master switch is moved quickly to a high-speed position. It is accomplished by current-limiting or definite time relays.

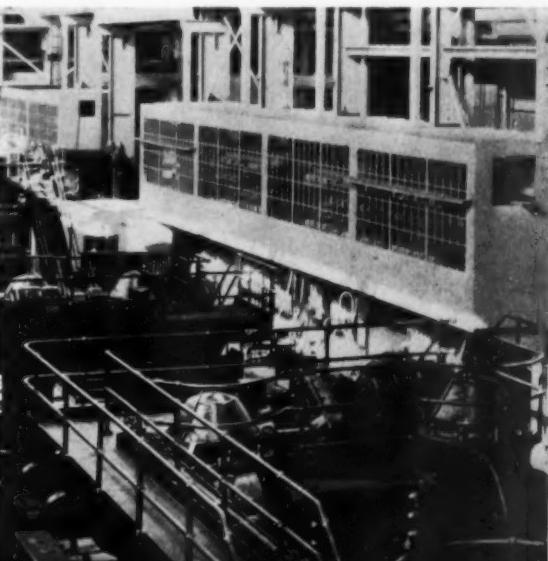
The primary circuit may be arranged for either manual or magnetic operation and either reversing or non-revers-

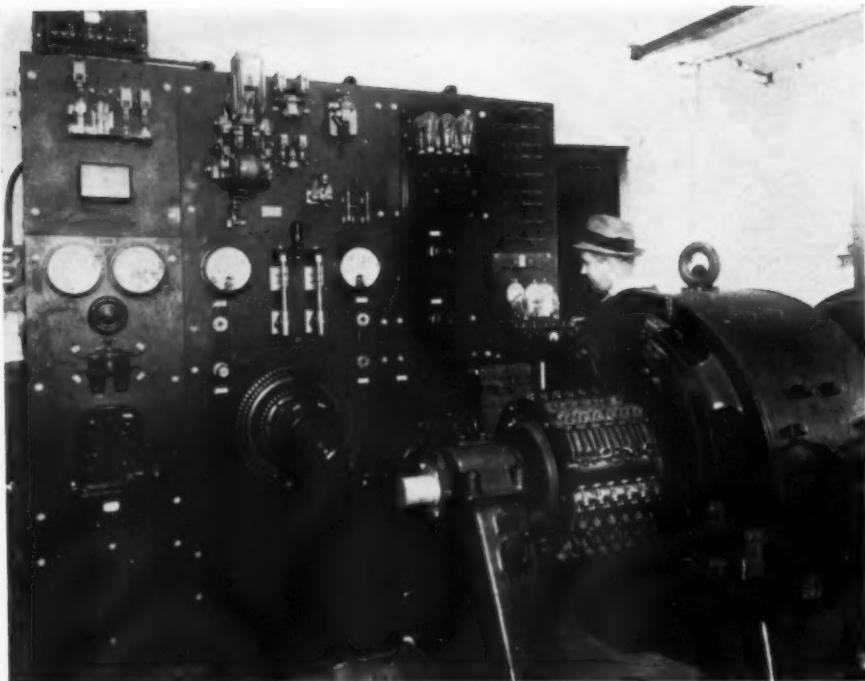
ing service. The primary circuit may be either high voltage, 2,200 volts and above, or low voltage, 600 volts or less. For high voltage installations the primary switching equipment may be either air-break or oil-immersed units.

With a master switch for the operator to control the equipment, it is possible to arrange the control to permit quick stopping by plugging the motor to a stop, or effect a quick reversal by throwing the master switch directly from one direction to the other.

This type of control is frequently used on hoists where heavy loads will overhaul the motor. If the load is not seriously overhauling, the equipment will operate the motor with regenerative

**BALCONY MOUNTED** — Control equipment in a steel mill, centralized and located in a space otherwise unusable in respective departments.





**ELECTRONIC CONTROL** for speed regulation of paper machines. To facilitate testing, a voltmeter on the regulator can be plugged into various tube circuits without removing the tubes.

braking applied. The degree of braking may be controlled by the amount of resistance in the secondary circuit.

For very positive overhauling loads, the primary connections to the motor may be made in the opposite direction to operate the motor in the hoist direction although the load is descending and turning the rotor in the reverse direction. This condition is sometimes designated as counter-torque braking or plugging.

When very fine speed adjustments are required on a wound rotor motor the resistor and contactor type secondary control is replaced by the three-phase type of liquid rheostat. The electrolyte solution provides the resistance and the movable electrode plates are raised or separated from the stationary electrodes to increase resistance.

The liquid rheostat is used in connection with a wound rotor motor with fly-wheel installation, to reduce the current peaks on fluctuating loads. The unit is commonly known as a slip regulator on such applications.

#### Angle-Switching Control

When synchronous motors are used it is possible to connect different motors, on a given machine such as a compressor, to the line at different angular positions of the crank-arms. Effective current pulsations are thereby kept at minimum values.

By similar angle-switching means a motor may be connected to the line and field excitation applied at the time

when the torque of the synchronous motor is high or low, as best meets the needs of the installation.

Angle-switch equipment has two major units—(1) an induction generator, without rings or brushes, mounted on the shaft of the motor; and (2) an electronic-tube panel mounted with the motor control equipment. The induction generator can be adjusted to operate the tube at any predetermined angular position of the rotor of the synchronous motor.

When using angle-switching equipment, synchronous motors are started as induction motors on the damper winding. The angle-switching equipment is



**THEIR HOME**—Control panels for oil well drilling, in a welded metal house.

energized when the motor is up to about 95 per cent speed, and it then applies excitation to the collector rings.

#### D.C. Variable Voltage Systems

Variable voltage systems are used when a large number of accurately adjusted low operating speeds are required, and where large amounts of d.c. power are involved. Typical applications are paper machines, roll drives for steel mills, and elevators.

The major parts of the system consist of the driving motor, a generator, one or more exciters depending on the variations of the system, and a main control panel. The master switches and other control devices are located near the operator.

In a simple arrangement of a variable voltage system, the exciter is self excited and has a rheostat in its field circuit. With constant voltage maintained at its terminals, the exciter furnishes power for the shunt fields of both the generator and motor, and for the control equipment.

A rheostat in the generator field circuit changes the generator voltage over a wide range. Since the motor armature is connected directly to the generator terminals, the motor speed will increase and decrease by small amounts as the generator voltage is increased or decreased.

The motor is usually operated at constant field strength and all speed control is obtained by adjustment of the generator voltage.

#### Location of Control

Since practically all controls for heavy installations are the magnetic type with master stations, the main control can be located at any convenient place. The master stations for controlling the machine are, of course, always located near the machine and where most convenient to the operators.

This plan permits control apparatus to be placed in centralized locations and in many cases special rooms are provided in which the equipment is placed. The control rooms are sometimes in basements, balconies or more distant places. For dusty and dirty atmospheric conditions the separate control room eliminates much of the maintenance troubles due to dirty conditions.

For gaseous conditions such as prevail in the vicinity of oil wells, the control equipment is often located at a distant point, that is, out of the gaseous danger area. Remote locations are also desirable when destructive fumes are present. High voltage apparatus should always be placed in remote locations or adequately protected by enclosures.

# ELECTRICAL MAINTENANCE GUIDE SHEET

## MARKINGS ON CONTROLLERS AND DIAGRAMS

For power circuits and control connections

Line	L <sub>1</sub> -L <sub>2</sub> -L <sub>3</sub> -L
A.C. Primary	T <sub>1</sub> -T <sub>2</sub> -T <sub>3</sub> -T <sub>4</sub>
A.C. Secondary	M <sub>1</sub> -M <sub>2</sub> -M <sub>3</sub> -M <sub>4</sub>
Transformer Primary	H <sub>1</sub> -H <sub>2</sub> -H <sub>3</sub>
Transformer Secondary	X <sub>1</sub> -X <sub>2</sub> -X <sub>3</sub>
D.C. Armature	A <sub>1</sub> -A <sub>2</sub>
D.C. Series Field	S <sub>1</sub> -S <sub>2</sub> ; S <sub>3</sub> -S <sub>4</sub>
D.C. Shunt Field	F <sub>1</sub> -F <sub>2</sub> ; F <sub>3</sub> -F <sub>4</sub>
Control	I-2-3-4-5-6

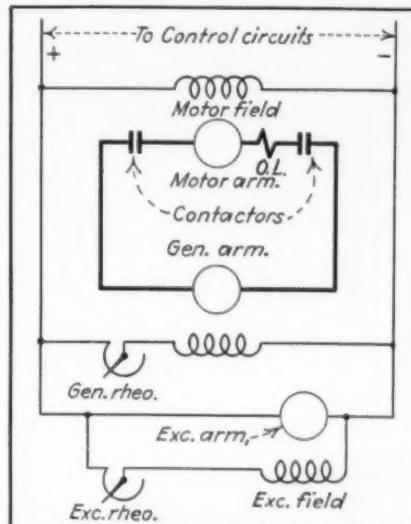
For devices, in connection with symbols on diagrams, to indicate their function or use.

(Recommended N.E.M.A. Industrial Control Standards)

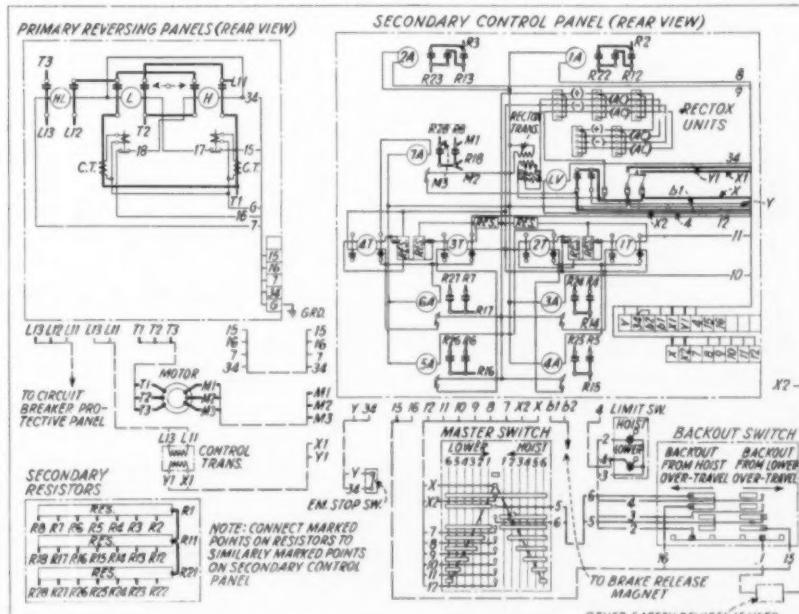
Armature Acceleration	A
Armature Shunt	AS
Auxiliary Switch (Breaker) Normally Open	"a"
Auxiliary Switch (Breaker) Normally Closed	"b"
Brake	BR
Compensator-running	MR
Compensator-starting	MS
Control	CR
Door Switch	DS
Down	D
Dynamic Braking	DB
Field Acceleration	FA
Field Dynamic Braking	DF
Field Failure (Loss of field)	FL
Field Forcing (Decreasing on Variable Voltage)	DF
Field Forcing (Increasing on Variable Voltage)	CF
Field Protective (Field weakened at standstill)	FP
Field Reversing	FR
Field Weakening	FW
Final Limit—Forward	FLF
Final Limit—Reverse	FLR
Final Limit—Hoist	FLH
Final Limit—Lower	FLL
Final Limit—Up	FLU
Final Limit—Down	FLD
Forward	F
Full Field	FF
High Speed	HS
Hoist	H
Jam	J
Kick Off	KO
Landing	LD
Limit Switch	LS
Lowering	L
Low Speed	LS
Low Torque	LT
Low Voltage	LV
Main or Line	M
Master Switch	MS
Maximum Torque	MT
Motor Field	MF
Overload	OL
Pilot Motor	PM
Plug	P
Reverse	R
Series Relay	SR
Slow Down	SD
Thermostat	TS
Up	U
Undervoltage	UV
Voltage Relay	VR

## MAINTAINING CONTROL

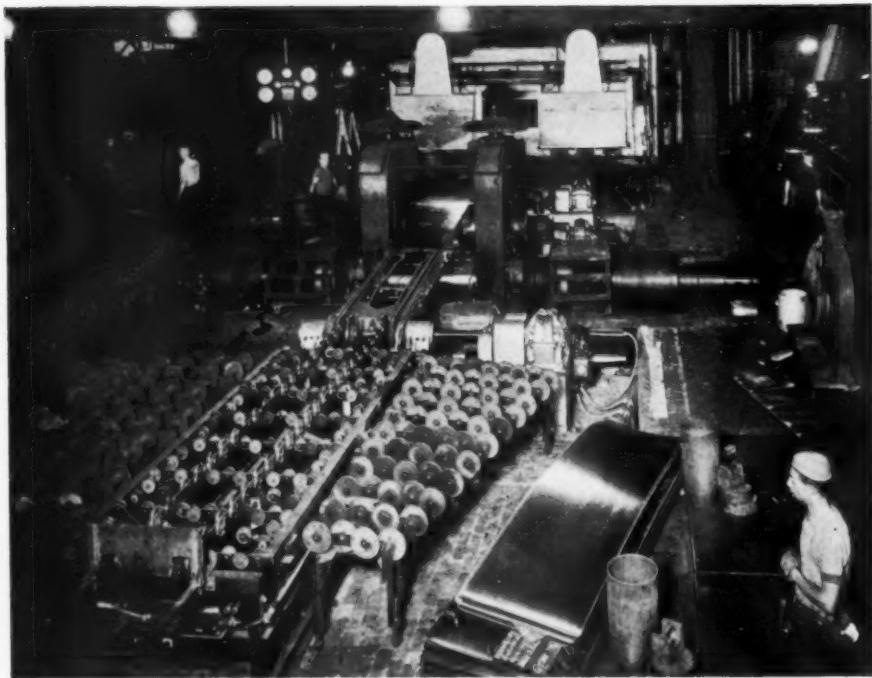
- Select control of adequate capacity for motor or circuit, and according to recognized safety codes.
- Check equipment for application, rating, loose connections, and mechanical injury from improper handling.
- Follow manufacturer's instructions and diagrams for installation and connections of control.
- Install control in a dry place and keep it dry.
- Use wire and cable of ample capacity, and properly insulated for protection from mechanical injury and damage from heat, oil and water.
- Inspect control regularly.
- Clean all parts and enclosing cases.
- Tighten all connections, also hinge and cotter pins.
- Replace all worn parts.
- Keep a snug fit of fuses and clips, and of knife-switch jaws and blades.
- Use proper size of fuses—not oversize.
- Check operation of overload devices occasionally, and rating of heater elements or overload setting for motor being controlled.
- Test emergency control devices.
- Clean, adjust and maintain pressure of tips on contacts and interlocks, of fingers and segments on drum and master switches; tighten shunt connections.
- Avoid use of oil or other lubricants on contactor bearings and tips, drum switch fingers and segments.
- Keep arc shields in place and renew before moulded material is burned away.
- Tighten mounting screws and bolts of contactors, pilot devices, and resistors.
- Maintain oil level; check for water in bottom of tank; clean oil tanks.



SCHEMATIC DIAGRAM of connections of d.c. variable voltage system.



TYPICAL WIRING DIAGRAM for reversing magnetic control, high-voltage primary and low-voltage secondary, with master switch and other control devices, for applications such as mine boists.



**MASTER CONTROL DEVICES** govern the operation of this two-high sheet mill with automatic roller and catcher tables, conveying equipment and furnace control.

When possible it is desirable to have the control equipment within sight of the machine and the operators. Control rooms often have glass sides to permit observation of all equipment simultaneously.

When the location of control apparatus is being determined its accessibility for maintenance purposes is most important. Conduit and wiring connections should be arranged to permit ready access to all parts of the control.

Examples of locating controls appear here in several Westinghouse installation photographs.

#### Protective Measures

High voltage apparatus must always be protected from contact by all operators and workmen. The contact making parts are often oil-immersed but the entire assembly, whether oil-immersed or air-break type, should be entirely enclosed either in cubicle type structure or within a grille type enclosure. For high voltage equipment a voltage transformer is used so that the voltage on control operating coils and master stations will be reduced to a safe value for the operators.

Control circuits are arranged so that a machine will not start unexpectedly after it has stopped because of overload or voltage failure. This type of circuit is essential on machines that might injure operators if unexpected starts occur. This is popularly known as a "low voltage protection" feature.

Another type of control circuit that permits automatic starting at any time

as determined by a float switch, pressure device or other automatic master station is known as a "low voltage release" circuit. This circuit is required for fans and pumps where continuous operation is essential.

Safety switches, limit switches and emergency stop switches should be used liberally. The variety and applications of these devices are numerous and most any number of them can be used to provide important safeguards.

Many applications are of such hazardous nature that state laws and safety codes require certain protective features. Although some states may not have safety laws there is a marked tendency on the part of industrial companies to provide adequate safety measures. This is a commendable practice from the standpoint of safety to operators.

Safety devices are installed to obtain certain definite results on each installation but there are certain features that are commonly required of all installations. They must usually meet the following requirements:

- 1) Stop the machine as quickly as possible without unnecessary shock or stress on any part of the equipment.
- 2) Withstand frequent operation without injury to either the machine or the safety devices.
- 3) Operate so as to protect operators and equipment by opening control circuits rather than by closing them.
- 4) Whenever possible the device should be made so that breaking

a wire or failure of any part essential to safety stopping with immediately stop the equipment when a failure occurs.

The control equipment is the unit that determines the successful operation of the entire installation. If it does not function properly, delays or imperfect products result.

#### Inspection

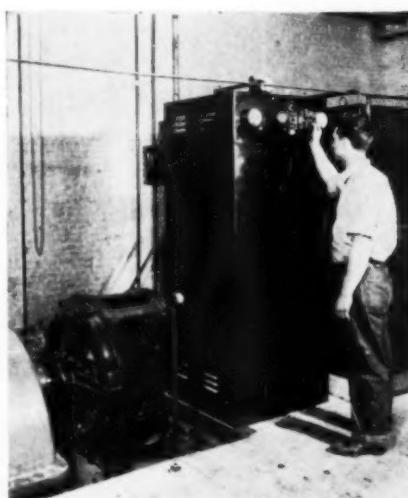
Since the control is so essential to correct operation, it deserves adequate regular inspection and maintenance. Regular attention corrects minor troubles that eventually would become of major importance.

Frequent inspections reveal the presence of dirt, moisture, and the need for general cleaning. The frequency of inspection and cleaning depends entirely upon the operating conditions. An inspection schedule will soon be determined by a careful maintenance man, and adjusted to meet conditions.

Individual parts of the controller should be inspected for freedom of moving parts, absence of friction, worn bearings, and overheated parts. Current carrying connections should be tight, and not seriously burned, corroded or oxidized. Worn and damaged parts should be renewed promptly.

The individual parts should also be checked to be sure that springs are in good condition and that contact pressures are correct for the rating of the various units.

If the leads to the motor are disconnected either by a switch or by disconnecting the wires, the entire control equipment can usually be operated without operating the motor. This procedure permits making tests and inspections of individual devices and of controls that function as a complete installation.



**FOR DUSTY ATMOSPHERE**—Enclosed dynamic braking control adjacent to 250 hp. 4,000-volt motor on a rubber mill line drive.



*Out of 18 Months of  
Research and Development  
Has Come*

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### The New RLM SILVERED BOWL DIFFUSER

The new RLM Silvered Bowl Diffuser marks another forward step in the science of Industrial Light Conditioning. Jointly developed by the Mazda Lamp Manufacturers and the members of the RLM STANDARDS INSTITUTE, this new unit is the *first to fully utilize the distinctive indirect lighting properties* of the Silvered Bowl Mazda Lamp and yet retain a high degree of light utilization.

In the RLM Silvered Bowl Diffuser, the only light source visible in the normal field of view is the low brightness portion of the porcelain enamel reflecting surface. The direct light from the lamp itself is shielded from view by its silvered bowl.

Thus installations of these units produce a light which is particularly pleasing and comfortable to the eye.

RLM Silvered Bowl Diffusers, attested to by the Electrical Testing Laboratories as conforming to RLM specifications, can be readily identified by the RLM Label. Further information may be secured from your electrical wholesaler or any member of the Institute. Names of members as well as copies of the RLM specifications for RLM SILVERED BOWL DIFFUSERS, RLM DOME, RLM DEEP BOWL and RLM SYMMETRICAL ANGLE REFLECTORS may be had by addressing the Institute.

*The letters RLM stand for Reflector and Lighting Equipment Manufacturers*

**RLM STANDARDS INSTITUTE**

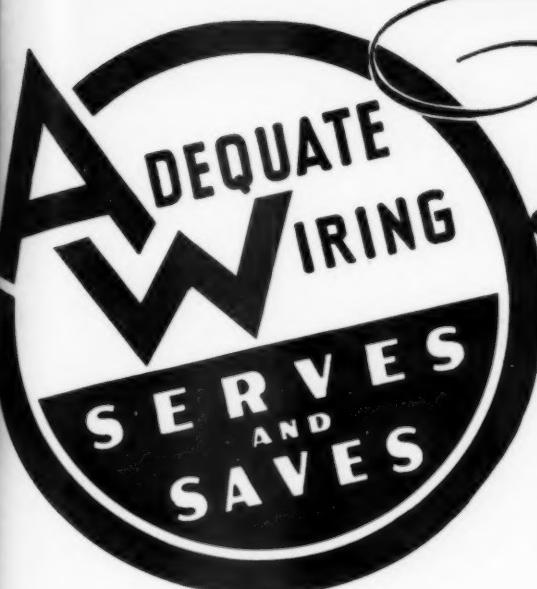
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ITS INSULATION



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THIS REALLY  
**SIMPLE METHOD**  
MAKES POSSIBLE . .

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2 squeezes on the handle of the BM Indenter and the BM Connector or Coupling is securely fastened to the Electrical Metallic Tubing. Our tools and method of fastening are patented and we limit the license of our tools under these patents to the installation of our fittings only.

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Test this service—see for yourself—get all the "breaks" you have coming in your wire and insulating material purchases. We handle Essex wire—drawn and rolled from the best grade Electrolytic Copper Rod stock. A complete stock of round and square Magnet Wire kept in stock. Rectangular sizes shipped from our Detroit factory just as promptly.

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**Danger Signs  
for Underground**

Underground feeders connecting groups of factory buildings are often subjected to serious damage by construction workers. If the exact locations of buried raceways are not known, there is danger of cables being punctured by power drills or even a pick.

After such an accident occurred in the Passaic, N. J., plant of Raybestos-Manhattan, Inc., a system of identification was adopted for all underground, 2,200-volt feeder cables. The existing runs were marked by painting a broad red stripe on the pavement and on all concrete floors under which such runs are concealed. Where new 2,200-volt cables were installed the paving cuts and concrete chases were filled with red-colored paving material. Now when a construction worker reaches a red band he knows danger lurks below the surface.

**Electric Strip Heaters  
Reduce Costs**

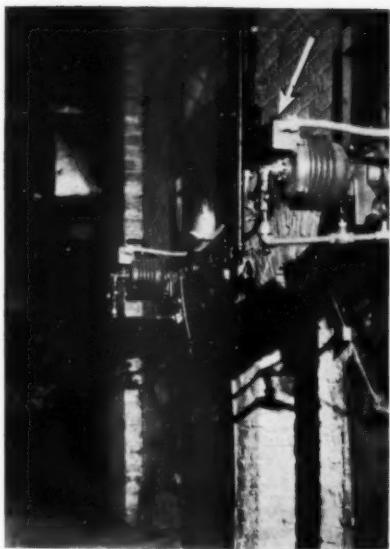
By using four 250-watt, 24-in. electric strip heaters instead of steam coils, as a source of heat for shoe-drying racks, one shoe manufacturer made substantial savings. One boiler could be shut down during the summer months and when production was slack.

Shoes are placed in trays which are a little over 48 in. high and about 14 in. wide. The heaters were located in the bottom of the trays.

The purpose is to merely dry the surface of the shoe soles so that they can be satisfactorily buffed; therefore, no intense heat is wanted. Consequently, the heaters were wired and located so that on medium heat only two units are connected, and, at the same time provide for the proper distribution of heat.

**Starters Need  
Ventilation**

In one plant, the starters for some motor-driven oil burners, which they were to control, were located on the front of a kiln. The starter boxes were fastened directly to the brick work by means of small screws set in lead. When the kiln was on high fire, the burners would trip out. The correct size of heater coils was being used and nothing could be discovered wrong with the motor or wiring. Apparently extra heat from the kiln was



**MOTOR STARTERS** for oil-burners were fastened to brick work of malt kiln. Quarter-inch nut placed on each holding screw and between boxes and bricks permits air circulation in back of starters. This eliminates tripping of overload relays caused by heat transmitted through walls of kiln.

just enough to raise the initial heat to the extent that the normal load on the motor would eventually cause the starter to trip out.

To correct this condition, a quarter-inch nut was placed behind the boxes and on each holding screw. This held the starting box a short distance away from the surface of the brick work so that the air could circulate in back of the starter. There was no more trouble with the tripping of the motors.

Admittedly, the starting box was located so that it would get enough heat to cause the starter to trip, but there are locations where the starter must operate in too warm a place. Here, if adequate ventilation cannot be obtained, it will be necessary to use the next larger size of heater coil.

### \$10,000 Saved With Graphic Recorder

In a Minneapolis manufacturing plant, the electrical engineer made a careful graphic study of the performance of each piece of motor-driven equipment. If the drive was inefficient, it was changed. If the motor was too large or too small, the correct size was substituted. If the friction load was too high, the cause was found and eliminated. It took three years to do the job—but it paid. Power savings of \$10,000 annually have been effected despite a 25 per cent increase in tonnage of production.



### FROM ONE DEPENDABLE SOURCE OF SUPPLY

The very completeness of the Ward Leonard Line of Electric Controls enables the contractor to select from a single source of supply the several controls he builds into the job. Thus he is assured of co-ordinated units, simplified service, and centralized responsibility. Each item in the Ward Leonard Line is the acme of its type and kind. The wide range of mountings facilitates installation and eliminates compromise.



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**TORCHES**  
**AND SOLDERING**  
**IRONS...ideal for**  
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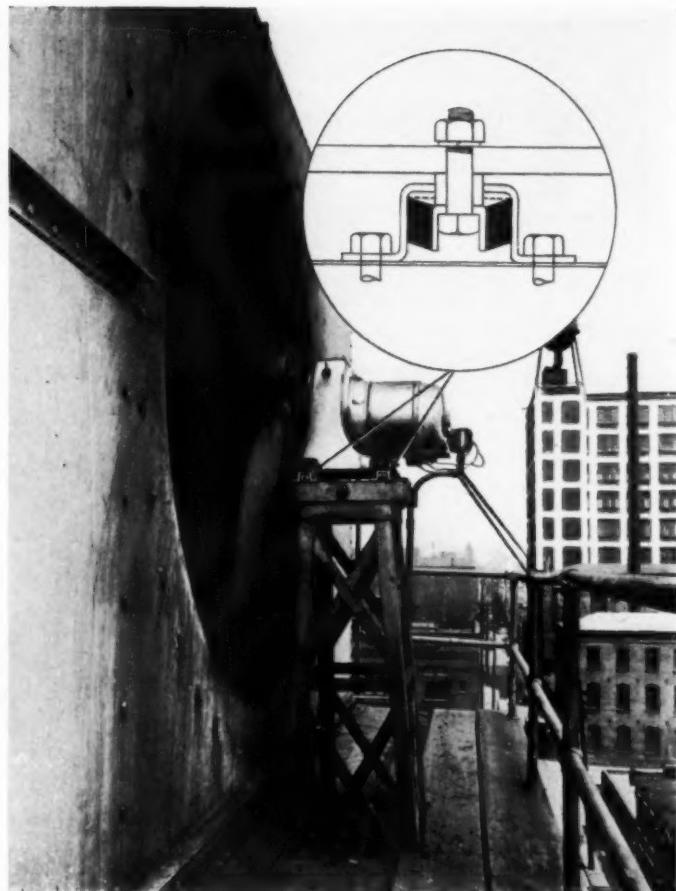
**Prest-O-Lite** Torches and Soldering Irons are available in convenient and moderately priced outfits, covering every open-flame or enclosed-flame requirement of the electrical contractor. These appliances are economical equipment for soldering, heating and brazing.

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Dominion Oxygen Company, Limited, Toronto

RUBBER MOUNTINGS kill noise in this airplane-type fan at Industrial Cold Storage Company, Philadelphia.



### Rubber Mounting Killed Noise

United States Rubber Products, Inc., reports a spectacular instance of noise reduction accomplished by the use of its "safety type" rubber mountings. It was in the plant of Industrial Cold Storage Company, Philadelphia.

A large airplane-type fan driven through a reduction gear was used to supply air to a water cooling tower. The whine of the gearing was so loud that it was offensive to people located more than a mile away.

Analysis showed that the gear teeth were coming into mesh at the rate of 29,240 times per minute. Vibration at this rate produces a note almost an octave higher than "Middle C" on the piano. The fan was metallically connected to the steel walls of the cooling tower, and these walls, acting as a huge loud speaker, amplified the vibration into a loud noise.

Rubber mountings were installed, loaded to obtain a deflection which would absorb 29,240 vibrations per min. without resonating at the power speed of 1,720 r.p.m. or the fan speed of 384 r.p.m. The result was practically 100 per cent effective.

The tremendous power of this blower unit, located directly above a street, made safety an all-important factor.

Faulty anchorage might cause untold havoc. The mountings used provide this safety, for even though the rubber itself is destroyed by fire, or otherwise damaged, the mountings cannot pull loose.

### A.B.C. of Power Factor

By F. W. Willey  
Willey-Wray Electric Co.  
Cincinnati, Ohio

Electrical power delivered by a d.c. generator is easily figured by reading the voltmeter and the ammeter, and multiplying the volts by the amperes. The answer is the watts of power.

Output of an a.c. generator is different because the volts and amperes multiplied together seldom give a true answer of the power delivered. The real power is usually less by a percentage, which is called "power factor." In extreme plant conditions this percentage may be as low as 50 per cent.

In the simplest single phase (two-wire) a.c. circuit, the first wire is positive at one instant and then a quick reversal of the condition makes the second wire positive. The amperes go where they are pushed by the voltage and therefore alternate back and forth through the circuit. The current makes

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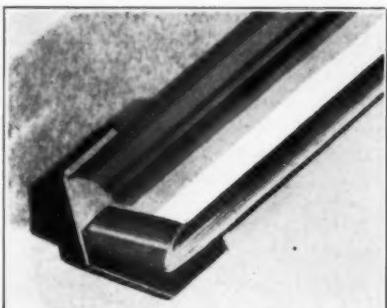
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Regardless of your location or requirements, Homer can give you the commutator service you're looking for. Designed by experienced commutator engineers and stocked in eight key cities, you are assured complete satisfaction and speedy delivery.

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356 E. CONGRESS ST., DETROIT  
Direct or thru your supply house



Automatic control of pumps for domestic water supply — automatic fire pump control to maintain pressure in the hose lines — the hose lines — this panel combines both of these. Indicating instruments, with visible and audible alarms are also mounted on this panel, thus indicating at all times the water supply in the tanks. All these features combined on one panel, manufactured, tested, installed and operated as a unit, assures correct interconnection of various parts to insure a constant water supply and fire protection.

"CLARK 3C" RHEOSTATS • "3C" BRAKES  
"3C" A. C. STARTERS • "3C" CONTACTORS  
"3C" EDGEWOUND RESISTORS • "3C" D. C. STARTERS • CRANE CONTROLLERS • CRANE PROTECTIVE PANELS • BATTERY CHARGING PANELS • AUXILIARY ELECTRICAL EQUIPMENT.



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**Gives You**

- **Faster**
- **Lower Cost**
- **Pipe Cutting**

Your skill at mechanics makes it easy for you to see why this **RIGID** Cutter with its new style wheel-blade can cut pipe more quickly and cleanly and last far longer, giving you extra economy.

For the **RIGID** knife-like blade is coined out of fine tool steel, hammered, heat-treated and then assembled in the hub. That's what gives it the unusual stamina for hundreds of extra cuts, reducing your cutter wheel expense, as thousands of users have found.

Powerful housing, guaranteed warp-proof, always cuts true, twirls easily to your pipe size. You like the "feel" of this tool, enjoy working with it.

For time and expense saving and a tool you get a "kick" out of owning and using, buy the **RIGID** Cutter—at your Supply House.

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**B**UNTING stock bearings for electric motors always fit, for they are finished in every detail to conform to the specifications of the motors they service. Available instantly in any quantity for all makes of motors from 1/50 hp to 100 hp. Write for catalog...The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

**BUNTING Quality**  
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just as many cycles as the voltage. Under some load conditions the amperes keep right in step with the voltage, but under other conditions they lag behind the reversals of the voltage. If this lag is one quarter of the complete cycle, the power factor is zero. If the current is in perfect "phase" with the voltage, the power factor is 100 per cent.

If an alternator is supplying 220 volts to a single phase circuit which draws 100 amp., the actual power may be anything from 22,000 watts down to nearly no watts at all, depending on the power factor of the circuit. Should the power factor be 50 per cent, the lines, though carrying 100 amp., are only providing power equivalent to 50 amp. in a circuit of 100 per cent power factor. The generator and the wires are loaded with 100 amp. but an engine card would show only about half of the equivalent load.

Lamps and most heating devices are almost pure resistance loads and these do not cause the current to lag. Whenever the current is carried in coils which surround iron or steel, such as in magnets and motors, there is a lagging influence which reduces the power factor. Motors have a very low power factor at no load, and as load is applied it increases to a maximum which usually occurs at a slight overload. The principal cause of low power factor in most plants is in underloaded motors or where the motor carries full load only a small portion of the time.

Low power factor may be determined: first, by the installation of a power factor meter; second, by calculations from readings taken on a voltmeter, ammeter and wattmeter; and third, by readings on voltmeters and ammeters and comparing the apparent power to an engine card.

### Less Time for Drying

Circulation of air in addition to heat, was adopted by a manufacturing chemist in New Jersey to remove moisture absorbed by paper while in transportation.

Unit heaters were installed in the storage room. They were designed so that the heater fan could be operated without steam in the heating coil. When the temperature in the room reached a predetermined value the steam was shut off and the fans continued to circulate the warm air.

By this arrangement paper is held only one week in the storage room. A considerable saving of time was made over the previous method of supplying heat only by steam heated pipe coils along the walls.



**"He wants to know  
when this starter will wear out!"**

Here is a starter that has been made as simple as possible. Bearings, pivots, and flexible jumpers have been eliminated. The double break, silver alloy contacts never need to be cleaned or filed. They are always in first-class operating condition.

Allen-Bradley solenoid starters will easily interrupt currents of not less than ten times their maximum horsepower rating. Millions of operations have been built in. Prove these facts to yourself by using Allen-Bradley standard starters on your toughest jobs.



**ALLEN-BRADLEY** SOLENOID  
MOTOR CONTROL

# These Machine Builders

# get TROUBLE-FREE CONTROL

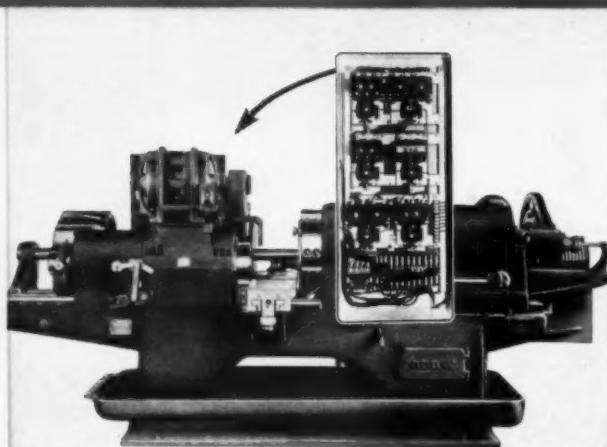
## with Standard



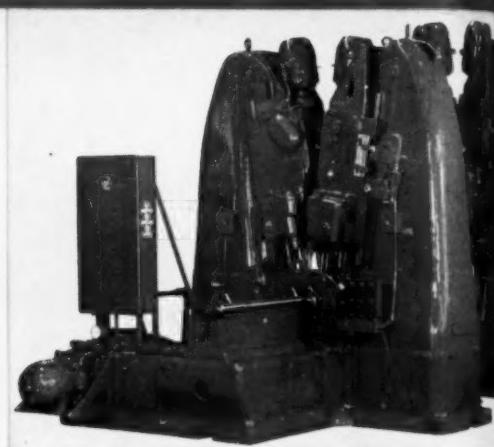
## Solenoid Starters



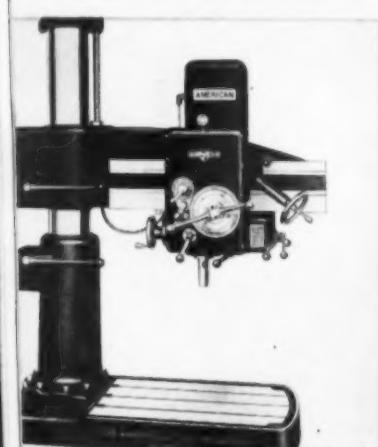
**PRATT & WHITNEY** hydraulic gear grinder with special control panel of three Bulletin 709 solenoid starters.



**CLEVELAND AUTOMATIC MACHINE CO.** single spindle turret lathe equipped with an Allen-Bradley control panel that synchronizes machine operations. Control panel is shown in the inset.



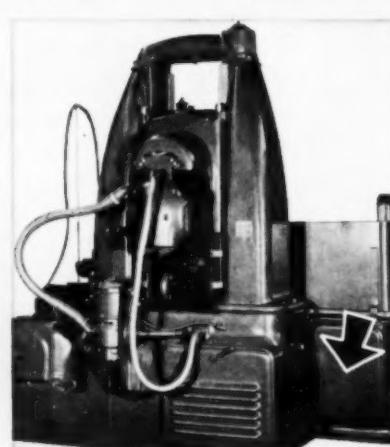
**FOOTE-BURT** 24-spindle automatic drilling machine controlled by special panel at left, made up of Allen-Bradley solenoid relays, contactors, and motor starters.



**THE AMERICAN TOOL WORKS CO.** "Hole Wizard" radial equipped with built-in reversing switch and solenoid starter.



**BRADFORD MACHINE TOOL CO.** drilling and tapping machine with complicated control panel neatly built into base.

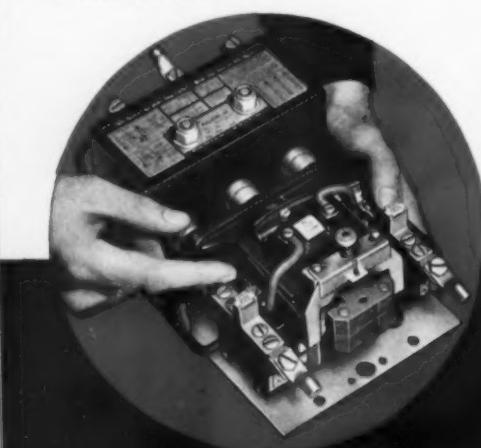


**MATTISON MACHINE WORKS** surface grinder with built-in control panel. Machined cover makes enclosure dust-tight.



**CROSS GEAR & MACHINE CO.** gear tooth rounder with control built into dust-tight enclosure.

Bulletin 709 across-the-line starter for squirrel-cage motors.



• Machine tool operations today have become exceedingly complex. Automatic sequence operations have replaced manual control in many places. Motor starters for these machines must give millions of trouble-free operations.

To provide this trouble-free performance the Allen-Bradley solenoid starter was made with the minimum of moving parts. All trouble-making pivots, pins, bear-

ings, hinges, flexible jumpers, and complicated mechanisms were eliminated. That's why so many prominent machine builders specify Allen-Bradley control. If you are looking for trouble-free motor control that never needs contact maintenance—that is compact, rugged, and easy to install—specify Allen-Bradley solenoid starters. Write for 24-page booklet, "The Story of the Solenoid Starter."

Allen-Bradley Company, 1307 S. First Street, Milwaukee, Wis.

# ALLEN-BRADLEY SOLENOID MOTOR CONTROL

# Questions ON Signalling

Answered by  
ALBERT A. SCHUHLER

## Fire Alarm On Non-Standard Boxes

**Q.** Conduits were installed for a future fire alarm system some time ago, but no standard fire alarm station outlet boxes were installed. Instead large pull boxes were covered with blank steel plates.

The outlet boxes for the bells are found to be satisfactory. But the fire alarm stations to be installed at this time are to be of the semi-flush type and the present pull boxes are considerably larger than the stations. How may the stations be installed?—H.S.

**A.** The only solution to this problem is to provide an adapter plate and mount each fire alarm station on it. Perhaps the present blank plate will be sufficiently large. On the other hand the plate should be heavy enough so that it will present a good appearance. Another thing that should be checked is the depth of the boxes. If the plate is not sufficiently heavy, new plates should be made at least as large as the outer case of the fire alarm station, preferably a trifle larger. In the event the outlet boxes or pull boxes are not sufficiently deep, it will be necessary to place a mat between the outer case of the fire alarm station and the adapter plate. The sketches (lower right) indicate methods to be followed.

## Waterflow Alarm

**Q.** How may a waterflow alarm signal be installed in a water pipe line used in connection with a manufacturing process?—P.B.

**A.** It will be necessary to insert a pipe fitting into the pipe and install a waterflow switch on the fitting. The waterflow switch is combined with a valve and will operate when there is a flow of water in the pipe. This is accomplished when the valve clapper is lifted, and this results in actuating a

pair of contacts which in turn operate a signal or a transmitting device to give a special coded signal.

## Silent Office Call System

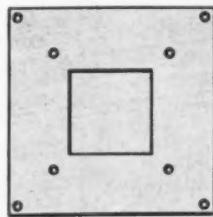
**Q.** How may an office be equipped with a silent call system for calling stenographers, clerks and office boys to executive offices? What type of equipment is recommended?—E. S.

**A.** There are two general types of systems used for this purpose—the lamp type and the drop type. The lamp type, which may be divided into two groups, is becoming the most popular. One type using lamps is controlled by toggle switches. Another type is controlled by momentary contact push buttons and in addition requires the use of relays. The drop type is operated in a similar manner as the electrical reset type annunciator and requires momentary contact push buttons.

The executive offices would be provided with directory pads having a contact device for each outlying station to be called. If toggle switches are used for calling purposes, only the lamp type system is used. The lamps are also reset from these same toggle switches. If momentary contact push buttons are used, either the lamp or drop type of system may be employed.



Adapter Plate



Cut for Station



Station Mounted

**USING OLD BOXES**—Method of adapting boxes that are too large for modern fire alarm stations.

Resetting of signals in these cases is accomplished by operating momentary contact push buttons at the signal. The outlying stations may consist of either single or multiple type indications.

## Beauty Parlor Booth System

**Q.** "What is the recognized standard practice for the operation of a beauty parlor booth signal system? What type of equipment is used?"—O. J.

**A.** The operator in the booth must be able to signal and advise the appointment desk, first, when booth is occupied, second, when booth is unoccupied or soon will be vacant, third, when maid should be sent to booth. The attendant at the desk may acknowledge signal, or call operator by pressing corresponding button on annunciator.

The type of equipment generally used in this type of system provides first, a special annunciator at the appointment desk, which consists of a set of three lamps of different colors for each booth. These lamps are marked "Occupied", "Vacant", "Maid". In addition, a push button is placed alongside each group of three lamps, which is used for operating the buzzer in the booth. Second, each booth is provided with a station having three toggle switches and a buzzer. The toggle switches are marked the same as the lamps in the annunciator, for a given group.

## Bridle Rings Supporting Wires

**Q.** What method is followed in running a small number of twisted or single low-tension wires along the outside walls of a building?—R.D.

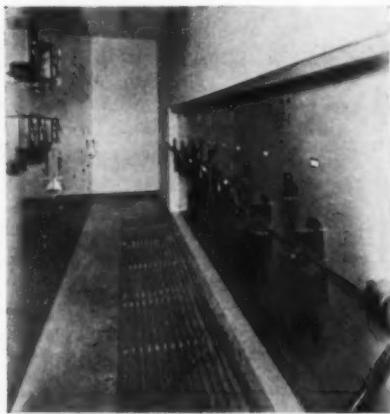
**A.** The method followed by telephone companies and other concerns making a business of installing signal wires is to use bridle rings. These supports may be screwed into brick, concrete and wood walls. The wires are pulled or slipped into the rings and drawn tightly. Bridle rings should be installed at frequent intervals in order to prevent excessive sagging, and to properly support the wires.

# WIRING Methods

## CENTRALIZED LOAD CONTROL

The recently completed Provincial Parliament building at Quebec was selected as a central point to receive 4000-volt primary power, and from which to control and distribute it safely to adjoining government structures. Certain features of design and installation were followed when this installation was made by Goulet Ltd., electrical engineers and contractors of Quebec, which indicate the steps taken to provide maximum safety as well as continuity of current supply.

Main primary services were brought in from two outdoor networks to make two sources of power available, and thus avoid a possible outage because of some outside cable failure. The two



**SAFETY SWITCHING:** Main and feeder oil breakers are interlocked with dead front levers that control line disconnecting switches for each unit.

400-amp. main oil circuit breakers for these primary services were mechanically interlocked to permit only one feeder ever supplying this station. In addition, each of these circuit breakers, and four breakers controlling feeders to transformer stations in other buildings have mechanically interlocked disconnecting switches. These disconnecting switches are in the line side of the primary circuit for isolating breakers when they are opened for maintenance. The



**BEHIND THE BOARD:** Remote operated oil circuit breakers and transformers are neatly arranged in a separate room behind the recessed switch lever board.

operating levers for all disconnects are mounted beside their respective breaker levers, and cannot be manipulated until the breaker itself has first been tripped to the "off" position.

For greater safety to operators, there are special wood floor mats in sections in front of the breaker levers and in front of expulsion type cutouts within the transformer room. These mats are made of red birch, dried in paraffin, and assembled with wood pegs to form interlocked sections.

## Fixture Display Canopy

High ceiling conditions are a problem in arranging neat looking fixture displays. At the Booma-Gruener Electric Company, Inc., in Hartford, Conn., a display canopy was installed which is 33 ft. long and extends out 9 feet from the wall. It is suspended at the front from the ceiling, the supports being made of  $\frac{1}{2}$ -in. hanger rods.

The side walls of veneer panels are finished in natural maple, while the ceiling is stripped to form 36 square panels with fixture outlets centered in them. The ceiling finish is dull white enamel to give a pleasing color combination. A row of 16 large sliding drawers centered under the display forms a display counter and convenient



**ORDER OVERHEAD:** Canopy for displaying fixtures eliminates unsightly hanger boards in high-ceiling store.

storage for special shades, lamp parts and other small articles associated with lighting sales.

## Transformer Hookup

Floor mounted transformers usually involve an awkward wiring job, when connected to feeders on the ceiling above. The C. L. Smith Electric Company of Indianapolis, Ind. used an enclosed bus bar feeder suspended from the ceiling to make a neat job.

Primary service conductors are distributed to the transformer primary

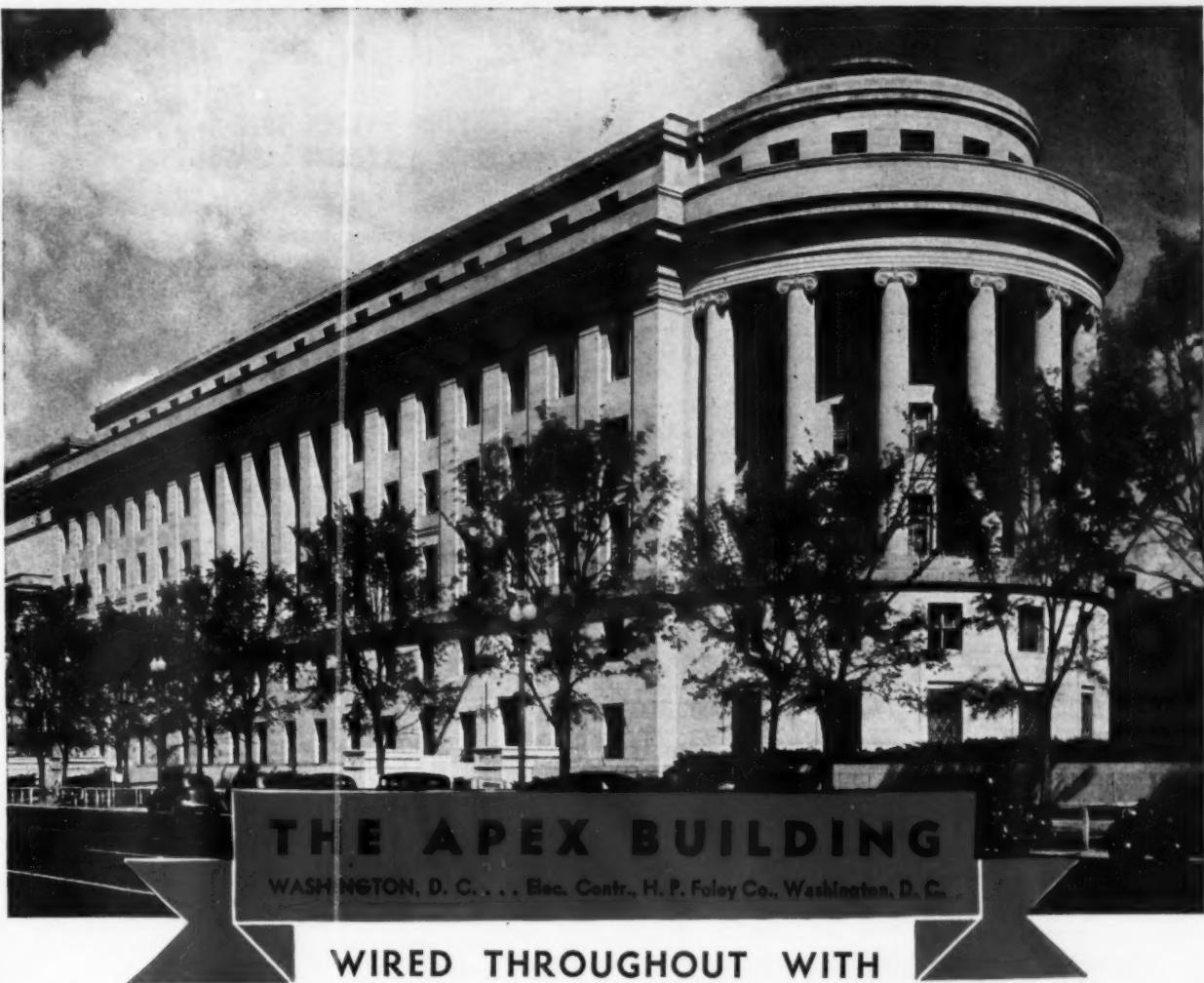


**OVERHEAD BUS:** Extends this installation of secondary leads to the main switchboard. Primary connections are made from a wall mounted trough back of the transformer bank.

terminals, through a wiring gutter mounted just above the level of the transformers on the wall. Leads are looped out through porcelain bushings in the bottom of the trough. Secondary leads are extended overhead.

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO

WIRES • SIGNAL CABLE • FLEXIBLE CORDS • LEAD-ENCASED AND PARKWAY CABLES • ARMORED CABLE



WIRED THROUGHOUT WITH

## CRESCE NT ENDURITE

SUPER-AGING . . . . HEAT RESISTING

### INSULATED WIRE and CABLE

The completion of the Apex Building, housing the Federal Trade Commission, culminates a 10 year building program that has given Washington, D. C. its famed Federal Triangle. Built to last for generations, the Apex Building is wired for permanence from cellar to roof with CRESCE NT ENDURITE Insulated Wire and Cable.

CRESCE NT ENDURITE is the logical choice where conductors are subject to excessive temperature and aging conditions; where maximum life is of prime importance and cost of replacement prohibitive.

**CRESCE NT**  
**INSULATED WIRE & CABLE CO. INC.**  
TRENTON, NEW JERSEY.

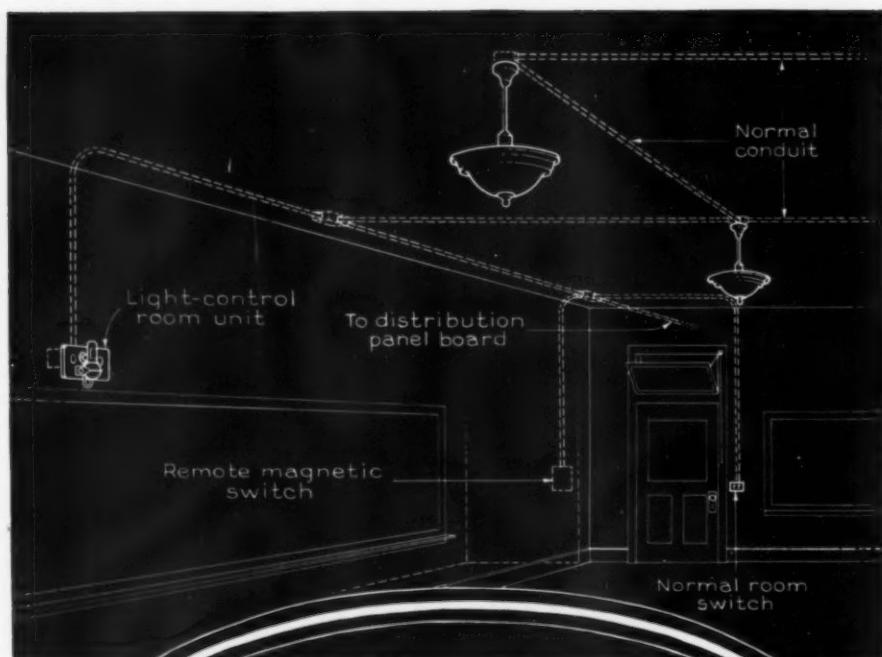
CRESCE NT ENDURITE SUPER-AGING INSULATION • WEATHER PROOF WIRE

SLACK TIME  
SELLING PAYS

An interesting experiment has been conducted by Grabe Electric Company, electrical contractor-dealer at Tucson, Arizona. When construction work was slack a post card was sent to all old prospects and customers of the company. It said that since construction work was off and the firm wished to keep its men busy it was sending a man with a free safety extension to install for the customer.

Installations were made with Add-here rubber extension material. No definite time was set. The men made solicitations on their own time, and it developed that some live wires had a natural gift for salesmanship. Three of them contacted twenty customers and made twenty installations. Others were not so successful, getting only two or three installations. No selling was attempted by the men except to make the installation. However, the men did leave literature showing the need for safe wiring, pamphlets on home lighting and any special appliance for which the prospect seemed to be in need.

Customers who were seen to be prospects were given certificates entitling them to a free gift from the store if they came in within a certain period to see the exhibition of appliances on display. This unique promotion developed several good leads for remodeling of the wiring. It also had a material effect on good will and advertising of the Grabe Electric Co.



## NEW PROFITS FOR YOU WITH G-E LIGHT CONTROL

**Y**OUR lighting-equipment sales will be greater—and easier to make—when you tell your clients about G-E light control, which *automatically*:

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2. Turns lights off when sufficient daylight returns.

In schoolrooms, drafting rooms, offices—for any work that requires the maintenance of good light—G-E automatic light control will:

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4. Make most efficient use of electric power.

We have prepared a pamphlet that will give you more complete information about the sales value of controlled light. Fill in the coupon below for this additional information.

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the G-E Automatic Relay Controls Your Light

**GENERAL ELECTRIC**

General Electric, Dept. 6A-201, Schenectady, N. Y.  
Please send me a copy of *G-E Photoelectric Relay for Automatic Light Control* (GEA-2679).

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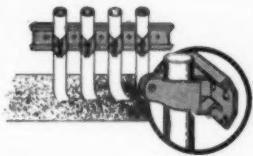
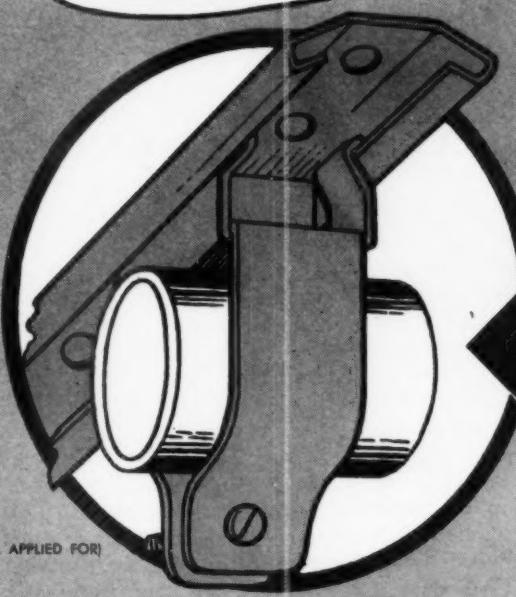
**WIRING ADEQUACY** takes the spotlight in Indianapolis where an active committee of the Electric League works out ways and means. Secretary Ted Brown of the League and A. J. Callaway of Graybar study the forms presented in *March Electrical Contracting* with an eye to fitting them into the local Adequate Wiring program.

# Contractors Acclaim...

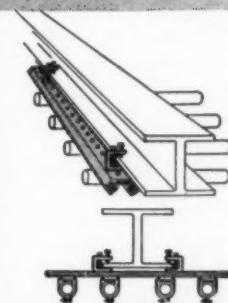
THIS  
NEW METHOD  
FOR HANGING CONDUIT

## The CLEVELAND CONDUIT HANGER ...FOR EASIER, QUICKER, NEATER WIRING INSTALLATIONS

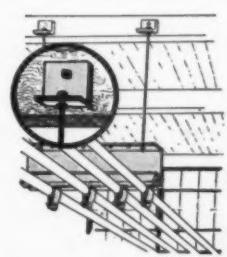
(PAT. APPLIED FOR)



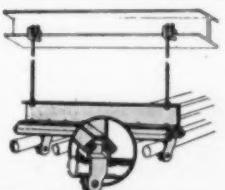
For supporting conduit to wall when rising from concrete floor for continuous stubbing up.



For supporting conduit directly to steel beams, with conduits either parallel or at right angles to beam.



For hanging conduit from wood beams.



For hanging conduit from steel beams.



For supporting conduit to concrete ceiling or wall.

Since our announcement of the new *Cleveland Conduit Hanger* last month, we have received first-hand evidence from the trade that this new hanger will do all we claim for it. Contractors report that it not only improves the appearance of the finished job, but also saves a noticeable amount of time on the installation.

It is utterly simple in design (only one bolt fastens both conduit in holder and holder in position on rail), and is extremely flexible in use. It takes  $\frac{1}{2}$ " to 4" conduit; rails can be quickly installed directly to, or hung from, concrete, wood, or steel beams; as many conduit holders can be slipped in as are required; and it can be used horizontally, vertically or at any angle.

Several applications of the *Cleveland Conduit Hanger* are shown here . . . enough, we feel sure, to convince you that it is truly superior (easier to install and neater in appearance) compared with all other methods of hanging conduit. But don't delay in finding out everything about it that will help you make more money! See your jobber immediately, or

FOR FULL PARTICULARS, WRITE:

**THE CLEVELAND SWITCHBOARD CO.**

2927 EAST 79th STREET

CLEVELAND, OHIO

# Questions ON THE Code

Answered by

F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

## Number of Service Equipments

**Q.** "In regard to the number of circuit breakers on one set of service entrance conductors, does this mean, not more than six branch circuits controlled by circuit breakers all in one cabinet? Or could one have six cabinets, each containing six branch circuit breakers on one set of service entrance conductors for dwellings? For instance, I wish to install circuit breakers instead of branch circuit fuses in branch circuits. I have a building with two apartments in same building. Each apartment requires say 6 branch circuits. I am going to use a flush cabinet with 6 branch circuit breakers. Can I connect both cabinets, each containing 6 branch circuit breakers, to one service entrance feeding through one cabinet to the other? This makes a total of 12 circuit breakers for the two apartments?"—A.C.B.

**A.** The answer to the above question is NO. The arrangement outlined above would require a main service switch and protective device (which could be, of course, a circuit breaker) of proper capacity to carry and to interrupt the entire current to the two circuit breaker cabinets.

Or, another permissible arrangement would be to have a main service switch and protective device or a main circuit breaker ahead of each breaker panel. There would thus be two sets of service equipments, one for each apartment and each one controlling its own cabinet.

## Exit Lights

**Q.** "I would like to have information on the wiring and installation of exit lights for public buildings,

in particular regarding the location of switches (if any are used in these circuits) and provisions for fusing. I would also like to know what type of wiring is approved for this work, where the exit lights must be installed in the gymnasium and auditorium of a school building which is almost entirely of concrete and masonry construction."—G.P.E.

**A.** With the exception of theatres (including motion-picture houses) which seat over 100 persons, the National Electrical Code does not require the installation of exit or emergency lighting. However, exit and emergency lights are required by many municipal, county, or state laws and where these lights are required by some agency then the Code tells how they should be installed in Article 700.

In general, the emergency lighting must include the exit lights and sufficient illumination to enable persons to see their way out of the building (see Section 7003). Then the emergency lighting should be controlled by one switch located convenient to the main entrance to the building or for theatres in the lobby (see 7031, 7032, etc.). There should then be but one set of fuses between the emergency lights and the service entrance fuses (see 7041).

## Adequacy Provisions Enforceable?

**Q.** "Will you please inform this office whether or not local electrical inspectors will be able to enforce that part of the Code which calls for convenience outlets spaced at 10-foot intervals in every room of a dwelling, with the exception of a bathroom? While we have advocated outlets on this basis, we have never felt that consumers should be required to install them to this extent because of the high cost."—W.C.H.

**A.** There has been and will be some opposition to the enforcement of Section 2110 of the 1937 edition of the National Electrical Code. Here receptacle outlets are required to be spaced at not more than 20 feet apart in each kitchen, dining room, breakfast room, living room, parlor, library, den, sun room, recreation room and bedroom, when electrical wiring is installed. This rule has been termed an adequacy requirement. It is in reality a fire prevention measure designed for the welfare of the users of electrical equipment and, therefore, for the property owners.

It has repeatedly been demonstrated that a lack of sufficient outlets engenders the promiscuous use of flexible cords and other "hay-wire" wiring. These of course, are distinctly fire hazards.

Practically 100 per cent of violations written on electrical equipments on re-inspection work, after equipments have been in use for even a short period of time, contain the item, "Flexible cords used for circuit wiring." Numerous fires which have resulted from the use of such circuit extensions, attests to the fact that a fire hazard exists.

There are many records also of personal accidents resulting from this type of wiring. It, therefore, seems that such a rule is perfectly proper to include in the National Electrical Code and one which can be enforced.

## Lead Duplex Underground

**Q.** "Is it permissible to use lead cable in under-plaster extensions (concealed)? Also is it permissible to use lead covered cable underground without using conduit? This is unarmored cable."—L.H.C.

**A.** Lead covered wire generally known as lead duplex or lead single is not permissible under the Code for use in under plaster extension work, nor for use underground without conduit.

Armored cable, type AC, not of the leaded type, is not permissible underground, although it is permissible in under plaster extensions. A special shape of armored cable being somewhat oval, is widely used for making under plaster extensions.

There are some types of cable such as USE, Underground Service Entrance cable, some with lead and some without lead, which are permissible for use underground. These, of course, are not easily confused with the plain lead covered wire.

"THIS BEATS ANY  
PIPE AND CONDUIT BENDER  
I EVER SAW!"

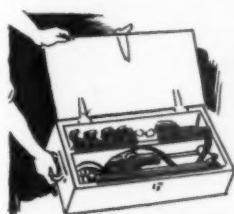


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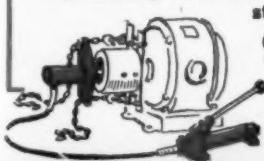
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(Left) Pulling drive pulley off electric motor shaft.



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## Grounding 440 Volt Circuit

**Q.** "Is it sufficiently grounded when a 440 volt system, with all conductors in rigid metal raceways, with threaded fittings made up tight, with two locknuts, one inside and one outside, used at all switches, boxes, cabinets and controllers and when this equipment is mounted on, or securely attached by bolts or welded to the members of the structural steel frame of the building? Is this the proper interpretation of Sections 2555, 2559 and 2561 of the 1937 Code? Does this meet with the requirements of Section 4436-a? Should a bonding jumper be installed at the motor from the conduit to the motor frame?"—J.A.H.

**A.** Section 2555 of the 1937 National Electric Code requires special attention to grounding on systems with voltages of over 150 volts to ground. If the boxes and cabinets in the raceway system are of the threaded hub type, as indicated in the question, compliance with the rule has been secured by making the threaded fittings up tight. If the boxes are not of the threaded hub type, then grounding may be effected by means of threadless fittings made up tight, or by means of two locknuts, one inside and one outside of the boxes.

Inasmuch as the above is required and as this insures the grounding of all of the raceway system, including all boxes and cabinets, no further concern need be given to Section 2559. The first sentence of Section 2559 will be already complied with. Section 2561 does not abrogate the necessity of complying with Section 2555; but where the voltage to ground is not over 150 then, according to Section 2561, the equip-

ment is considered grounded if connected or secured to members of the structural metal frame of a building.

If the terminal housing on the motor has the threaded hub and the conduit is made up tight into this, grounding will be effected as required by Section 4436 a and d. If the terminal housing is not of the threaded type, then Section 2555 should be complied with.

## Testing A Compensator For Operation

**Q.** "This CR1034-K1 compensator has not tripped out on overload or under voltage in 8 years of service. What method do I use to make sure that the relays would trip out if necessary? How can I test to make sure they are in working condition?"—A.C.B.

**A.** To test this out a brake could be rigged up to put a load on the motor and with an ammeter in the circuit a known overload could be caused. This type of device should trip out on 150% load (50% overload) in a little less than 4 minutes. To test for under voltage operation sufficient resistance could be placed in the circuit to produce a reduction of 25 volts at the motor which should trip the device.

## Additional Service Capacity

**Q.** "We have an installation of power and lighting load where the service comes into the switchboard room through current transformers and from there to a 400 ampere knife switch mounted on the switchboard. The power is taken to a 600 ampere switch mounted on another panel of the switchboard. All power and lights are metered on set of current transformers and one meter.

*It is now proposed to air condition a portion of the building, which will require an additional 600 amperes of power load. No additional meters are to be used. It is proposed to increase the service mains and the size of the current transformers to take care of the additional load.*

*As we now understand Section 2351 paragraph (a) of the National Electrical Code we would be permitted to subdivide the incoming feeder and take the air condition load through either a circuit breaker or a switch for this load only. Since the previous loads are not to be disturbed, we would not have to provide a main line switch or breaker for the entire load. The code states that 'The disconnecting means may consist of not more than six switches, or six manually-operated circuit breakers, in a common enclosure, or in separate enclosures grounded*



C. A. EASTMAN, sales manager of Ebasco Services, Inc. (Electric Bond and Share) now heads the Better Light-Better Sight Program and represents E.E.I. on the National Adequate Wiring Bureau.

at a readily accessible point nearest to the entrance of the conductors, either inside or outside the building wall.' Please advise whether our interpretation of this is correct."—G.H.W.

**A.** Our correspondent is correct in his interpretation of the Code on this subject. Rules 2351 and 2371-a 4 will permit the installation of a third service entrance switch with its fuse to take care of the air conditioning. These rules would permit up to six sets of service equipment, and in the case cited here, we have but three, viz.—one 400 amp. service equipment for lighting, one 600 ampere service equipment and the new 600 ampere service equipment for the air conditioning.

## Smaller Neutral on Service Cables

**Q.** "In 3-wire, 110/220 service entrance cable, one may use a smaller neutral than the outside. Why then is it necessary to use a larger neutral in the branch circuits when one neutral serves more than two branch circuits?"—A.C.B.

**A.** A smaller size conductor is permitted for the "bare" neutral of service entrance cables because it is not encased in rubber insulation and, therefore, has its heat dissipated much more rapidly than the rubber covered conductors. This "bare" neutral is given the carrying capacity of column C of Table 1 of Chapter 9.

With interior or branch circuits, the neutral must be fully insulated and, therefore, must be of the same size as the other wires. When one neutral serves as a common neutral for two or more circuits it must be of a larger size, as it has to carry a current equal to the sum of the currents of each circuit.



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*Lights When It's Locked and Only When It's Locked*



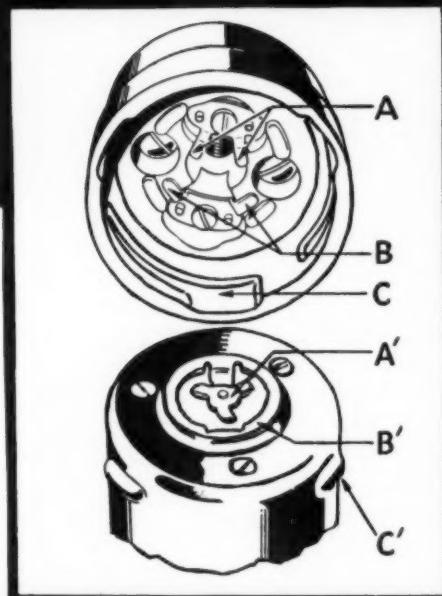
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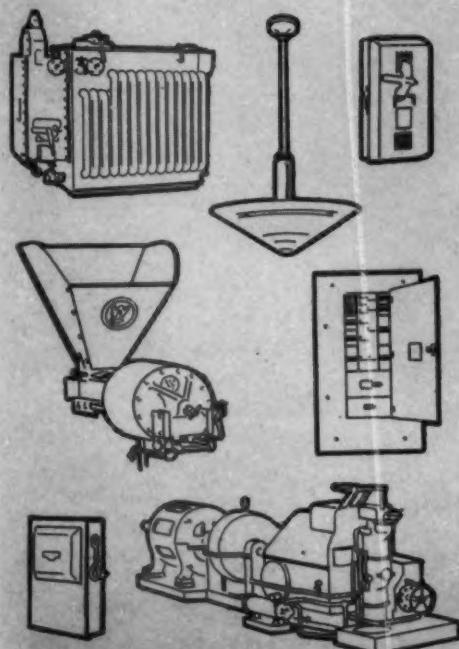
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Time and cost of wiring connections required for tapping instruments into a circuit can be eliminated! Only three simple steps are required to give you instant access to valuable operating facts about any electrical circuit:

**One: Install Type "S" Sockets**

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Westinghouse Sockets make it both convenient and profitable to adopt a planned maintenance program with socket instruments. Send today for complete information about this new, low-cost way to correct low power factor, overloaded or underloaded motors, electrical leaks, faulty process control, excessive machine friction and similar preventable profit leaks. Westinghouse Electric & Mfg. Co., Dept. 7N, East Pittsburgh, Pa.

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## FOR EVERY LIGHTING NEED



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The exclusive Westinghouse diamond pointed jaw confines the bead to sections outside the contact area.

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NOFUZE "DE-ION"  
CIRCUIT BREAKER

WESTINGHOUSE  
"DE-ION"  
LINESTARTER

WESTINGHOUSE  
"DE-ION"  
COMBINATION  
LINESTARTER

It was good news when first announced two years ago. And today, after two years of proved performance, the Westinghouse "De-ion" Combination Line-starter has the electrical world talking—and buying. That's because:

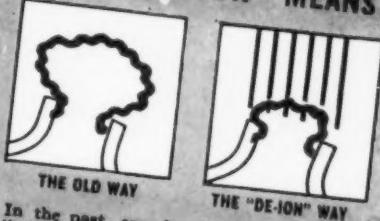
- IT SAVES IN INSTALLATION COST
- IT REDUCES OPERATING COST
- IT'S COMPACT
- AND IT'S SUPER-SAFE

Before you buy starters or circuit protective equipment, be sure to get a copy of the new booklet "4 Points to Check." Here in a few pages you will find complete information about the newest in motor control and circuit protection economies. Simply ask your electrical wholesaler.

Westinghouse Electric and Mfg. Company, East Pittsburgh, Pa.

J 20520-A

## WHAT "DE-ION" MEANS



In the past, arcs have been broken by "stretching". The "De-ion" quencher confines, divides and extinguishes the arc almost instantly—obviously preventing burning heat on contacts or arc barriers.

### CHECK THESE 9 FEATURES

- FULL SAFETY
- COMPLETE MOTOR AND CIRCUIT PROTECTION
- BI-METALLIC OVERLOAD PROTECTION
- FRONT OPERATING HANDLE
- AMPLE WIRING SPACE
- UNUSUAL ACCESSIBILITY
- COMPACT SIZE
- ATTRACTIVE APPEARANCE
- LOWER INSTALLED COST



## Westinghouse "DE-ION" COMBINATION LINESTARTERS

MOTORS • LINESTARTERS • CIRCUIT BREAKERS • SAFETY SWITCHES • PUSH BUTTONS

Distributed by **WESTINGHOUSE**

**ELECTRIC SUPPLY CO.**

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BUY FROM WESCO AND INCREASE YOUR TODAY'S PROFITS



## DESIGNING FOR TOMORROW

*has been a Bryant policy  
and practice for fifty years*

EVERY OUTLET  
DESERVES A  
BRYANT DEVICE



50 YEARS OF  
PROGRESS  
DEPENDABILITY  
QUALITY

- In the Bryant and Hemco line today there are more than 2,000 wiring devices. Fifty years ago you could count this line on the fingers of your two hands.

The progress represented by these figures has resulted from Bryant's policy of constantly contemplating tomorrow's wiring needs, and designing and manufacturing efficient devices to fulfill them. That's why the Bryant line today includes wiring devices for every modern need ...such essentials for "Adequate Wiring" as standard switches and outlets; clock, fan, radio, outdoor outlets; range connecting devices for the modern kitchen, and attractive wall plates to match modern decorations ...all in price ranges to suit all types of service.

Review this complete line in the Bryant "Easy-to-use" catalog.



SOLD THROUGH ELECTRICAL WHOLESALERS

THE BRYANT ELECTRIC COMPANY • BRIDGEPORT, CONNECTICUT

NEW YORK: 100 East 42nd St. • CHICAGO: 844 West Adams St. • SAN FRANCISCO: 325 Ninth St.

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# FACTS about the model wiring job of Westinghouse Dairy Electrical Proving Farm, Webster, N.Y.

- 1** Cable chosen throughout was Anaconda Durax Non-Metallic Sheathed Cable.
- 2** No wire less than No. 12 was used.

Even the way Durax is packed is an improvement. Just break out center "bull's-eye" and cable comes out as wanted.



**EASY** ...the rip cord in Anaconda Durax makes opening outer covering easy. A work-saver you'll appreciate.



**SPEEDY** ...the extra-heavy, triple weight outer sheath is pulled back *double quick!* No waste motion here!



**SIMPLE** ...pull off the paper tape. Code rubber compound comes away easily from copper conductors.

A sound choice it was...this selection of Anaconda Durax for the model farm wiring job of Westinghouse Electric & Mfg. Company at Webster, N.Y. And the fact that No. 12 was the smallest wire used is a useful lesson in adequate wiring. The ease, speed and simplicity of installing which made Westinghouse select Durax Non-Metallic Sheathed Cable is the best reason why this cable will help the wholesaler and electrical contractor. Let us tell you all about it. Get this booklet. 39446



Write for  
this FREE  
Booklet!

USE MODERN  
IMPROVED

## Anaconda Wire & Cable

ANACONDA WIRE & CABLE CO., General Offices: 25 Broadway, New York • Chicago Office: 20 N. Wacker Drive  
Subsidiary of Anaconda Copper Mining Company • Sales Offices in Principal Cities

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THE STEELTUBES SALESMS

*all*

Cold-Rolled Open-Hearth Steel

100% Electric Resistance Weld

Adequate Protection

Light Weight

Easy to Cut

Easy to Bend and Rebend

No Threads

3 Simple Fittings

Knurled Inside Surface

Uniform Corrosion-Resistance

Easy to Install

Universal Acceptance

Low Cost

Widespread Distribution

Assistance of a Field Force



*Always*



**ELECTRUNITS**

REG. U. S. PAT. OFF.

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MS

# Your Elbow

## ... READY TO HELP YOU SELL BETTER JOBS AT HIGHER PROFITS

The Steeltubes Salesman is not just an "order-taker"—nor is he selling a long list of items. He is a *service* man in every sense that the name implies. His job is to be at your elbow—ready to help you.

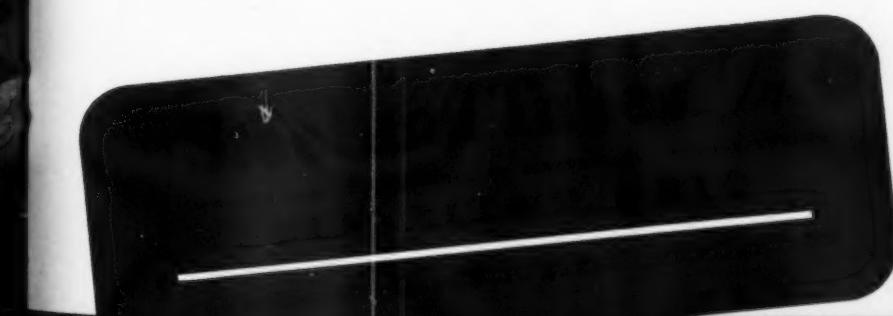
He can ably assist you in demonstrating and selling sound, low-cost wiring jobs that satisfy your customers—and enable you to make more money.

He can keep you posted on all new work coming up in your territory—and develop for you information on any job—anywhere.

He can keep you and your workmen up-to-date on latest developments in bending, fabricating, installation and prices.

He can help you to obtain service—delivery of material when you need it.

Put this man to work for you—and keep him there by insisting on this label.



# Steeltubes

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EVERDUR is a trade-mark of The American Brass Company registered in the United States Patent Office.

# Everdur

## ELECTRICAL CONDUIT

*has been used with outstanding success in:*

Breweries

Bridges

Cars

Chemical Plants

Dairies and Ice Cream Plants

Hot Houses

Industrial Plants—Generally

Locomotive Roundhouses

Oil Refineries

Packing Plants

Paper Mills

Pickling Plants

Public Utilities

Rubber Plants

Sewage Works

Subways, Tunnels

Tanneries

Textile Plants

**Everdur Electrical Conduit is strong, durable, and highly resistant to a wide range of corroding agents**

It is manufactured in standard sizes and in two wall thicknesses, electrical metallic tubing (E. M. T.) and rigid conduit (R. C.) and is listed and labeled by Underwriters' Laboratories. It may be obtained from authorized jobbers of electrical supplies. Of uniform temper and size, Everdur Electrical Conduit can be cut, threaded, bent and assembled with the same equipment used for steel conduit or tubing. Several complete lines of threaded and threadless Everdur Fittings are available. Publication E-12 gives detailed information and will be mailed on request.

38171

**THE AMERICAN BRASS COMPANY**

GENERAL OFFICES: WATERBURY, CONNECTICUT

Subsidiary of Anaconda Copper Mining Co.

**ANACONDA**  
from mine to consumer  
THE COPPER COMPANY OF AMERICA

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## WHEN YOU COME TO GRIPS WITH CABLE.

Use Buckeye Conduit that lets you pull a profit from the job just as easily as you can fish a cable through its oven-baked mirror smooth raceway. Good conduit is a combination of good pipe plus the proper non-conductive lining, and Youngstown is in the fortunate position of controlling the manufacture of Buckeye Conduit all the way from the iron ore.

The finished product reflects the advantages of that control. Ore, metal, manufacture, the finished conduit and its lining are all designed to go together into one excellent combination of those qualities of uniformity, ductility, ease of fishing and the high non-conductivity factor that contractors demand.

The universal acceptance of Youngstown Conduit is a true measure of these statements. Buy Youngstown Conduit and learn for yourself the faster time and greater profit you can make with it.

### THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels  
General Offices - YOUNGSTOWN, OHIO



Conduit - Pipe and Tubular Products - Sheets - Plates  
Tin Plate - Bars - Rods - Wire - Nails - Unions - Tie  
Plates and Spikes.

26-6A

# YOUNGSTOWN

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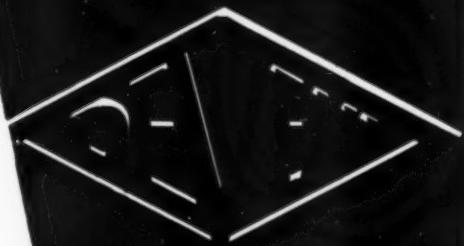
BUY FROM **WESCO** AND INCREASE YOUR TODAY'S PROFITS

# **TO YOU . . . THE UNITING OF THESE FOUR FAMOUS TRADEMARKS OFFERS . . .**

- ...biggest!*
- 1** The most complete line of signaling equipment available from any one source.
  - 2** Broader service facilities on signaling systems, as well as signal devices.
  - 3** Combined engineering skill—of the personnel responsible for the high quality of the products bearing these well-known trade marks—directed toward constant product improvement.
  - 4** Assistance by sales engineers qualified to help you with any signaling problem.

The acquisition of the Stanley & Patterson Company by the Schwarze Electric Company—individually known for the quality and completeness of their lines of electric signal devices and systems—offers electrical contractors the very certain advantages outlined above. If you are not now using either Schwarze or Stanley & Patterson equipment, we urge you to investigate immediately the added profit possibilities which this combining of "four famous trademarks" opens to you!

**STANLEY & PATTERSON**  
DIVISION OF  
**SCHWARZE ELECTRIC COMPANY**  
Michigan  
Adrian



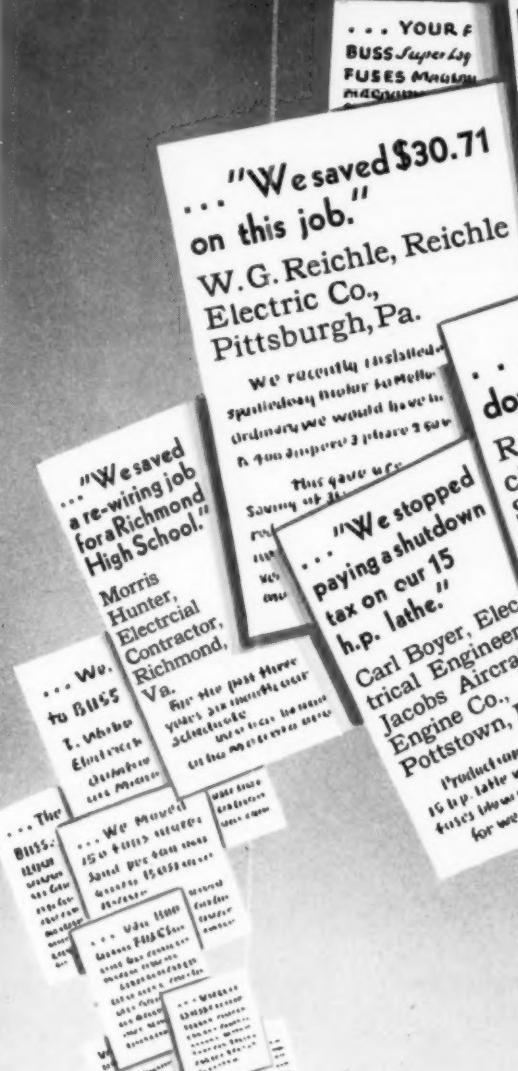
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**ELECTRIC SUPPLY CO.**

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# ... We Switched to BUSS SuperLag FUSES



... "We reduced our  
Fuse Blows 92%"

A. E. Shorten, Chief Electrician, John T. Lewis Co., Philadelphia, Pa.

"We have to shut down our plant several times every day operation because a heavy load is on the system."

"We spiked shutdowns on our grinders."

R. Monroe, Chief Electrician, American Brake Shoe & Foundry Co., Mahwah, N.J.

Prior to June 29<sup>th</sup> 1933 we experienced great trouble in getting ordinary 60 ampere 250 volt renewable fuses to handle the starting load of one of our grinders. The fuse would blow in about a minute.

"We stopped paying a shutdown tax on our 15 h.p. lathe."

Carl Boyer, Electrical Engineer, Jacobs Aircraft Engine Co., Pottstown, Pa.

Production was held up because the 15 h.p. lathe was being blown out for no apparent reason.

... "Saved us over \$5000 in time and material spoilage."

Robt. E. Bell, Martin Dyeing and Finishing Co., Bridgeton, N.J.

MAKING US TO MAKE A...

... "We abolished costly shutdowns on raisin conveyors by changing to BUSS Fuses."

A.R. Cornelius, Electrician, Fresno Plant, Sun Maid Raisin Growers

LATTER TWO TESTIMONIALS

WHY BUSS FUSES  
DON'T BLOW NEEDLESSLY



GET THE FACTS: Behind this evidence are basic reasons why BUSS Super-Lag Fuses don't blow needlessly . . . and after all, since we are dealing with money-waste isn't it a matter well worth executive investigation to determine just how senseless and unnecessary shutdowns can be eliminated — just how fuses can be made to protect — but not blow needlessly — just how others have profited handsomely by switching to BUSS Super-Lag Fuses. Send for a free copy of the Rb book on Fuses.

Bussmann Mfg. Co., University at Jefferson, St. Louis  
Division McGraw Electric Company

# BUSS SuperLag FUSES

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*These New*

# "EVEREADY" FLASHLIGHTS

## MEET EVERY INDUSTRIAL NEED

**for SAFETY  
in Gaseous  
Atmospheres**

THESE new "Eveready" focusing spotlights for use in explosive, gaseous atmospheres bear the inspection labels of *both* the U.S. Bureau of Mines and the Underwriters' Laboratories. They are SAFE under the dangerous atmospheric conditions listed on the label.

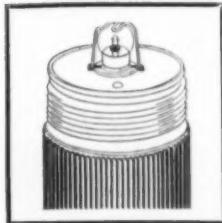


3359

3259

These new "Eveready" Safety Flashlights are of high quality semi-hard rubber reinforced with brass, with unbreakable, plastic lenses, special protected lamp and hand-replaceable, heavy-duty slide switch with positive "off" and "on" positions. Hexagonal heads prevent rolling, ring-hangers add to convenience.

"Eveready" Safety Flashlights resist water, oils, greases, gasoline, alcohol, acids, alkali, are non-conducting and proof against impact and dropping.



Guard wire holds lamp in spring-loaded socket. Should bulb break, spring ejects lamp-base, instantly opening electric circuit and thrusting hot filament against chilling guard wire.

**2 New  
FLASHLIGHTS  
are WATERPROOF**



3354

3254

The new WATERPROOF Flashlights, 3354 and 3254, are *completely covered*, switch-and-all, with a soft rubber sleeve. Unbreakable lenses, chrome plated reflectors. Proof against hot wires, acids, gasoline, oil, alcohol, greases and dirt.



3351

3251

3258

**3 more New Flashlights  
for Industry**

The two- and three-cell general purpose Industrial Flashlights, 3251 and 3351, have unbreakable lenses, hand-replaceable slide switches and are cased in semi-hard rubber. Safe with "hot stuff." Unaffected by water, oil, gasoline, alcohol, acids or dropping impact. No. 3258, the new Flexible Extension Flashlight, answers the demand for a safe light for inspecting moving machinery, drums, barrels, telephone equipment and hard-to-get-at spots.

**NATIONAL CARBON COMPANY, INC.**

Unit of Union Carbide  and Carbon Corporation  
General Offices: New York, N. Y. • Branches: Chicago, San Francisco  
The word "Eveready" is the trade-mark of National Carbon Co., Inc.

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# WIRES, CABLES AND CABLE ACCESSORIES

for Customer Satisfaction  
and Contractor Profit  
on Every Job

GENERAL CABLE CORPORATION

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# JEFFERSON FUSES . . . BOXES

## ALWAYS DEPENDABLE



- Since the beginning of the century Gem Sectional Switch Boxes, Outlet Boxes—Jefferson-Union Fuses have been well known in the electrical industry.

To the Jefferson-Union Fuse line, Jefferson Fustats have been added—filling the need for a protective device that resists tampering and eliminates over-fusing troubles.

The well-equipped Jefferson plant and long experience insure outlet and switch boxes of constant uniformity, facilitating quick installation.

Jefferson products are carried in Wholesalers' stocks for your convenience.

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**ELECTRIC SUPPLY CO.**

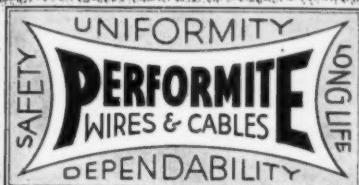
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# HAZARD PRODUCTS

## PERFORMITE INSULATION

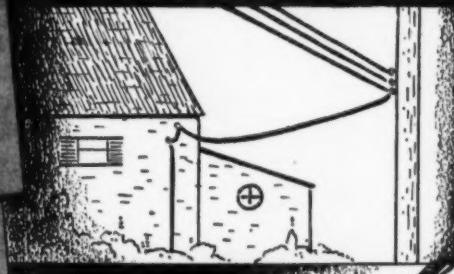
Performite is a higher type of rubber insulation which affords longer life and greater safety. Performite rubber insulation is tougher and stronger than any in common use heretofore, and has greater life. It is made with Hazard "Firekrome" weatherproof and flame-retarding finish.



## HAZARD SERVICE ENTRANCE CABLES, Type SE

The small sized pipe-enclosed wires of many old type house services definitely limit the customer's load.

These modern cables with bare neutral conductor especially fit in with the new sequence arrangement of meter, switch and fuse. Their low cost, ease of installation, insurance against current diversion and practically zero maintenance cost, make them particularly attractive.



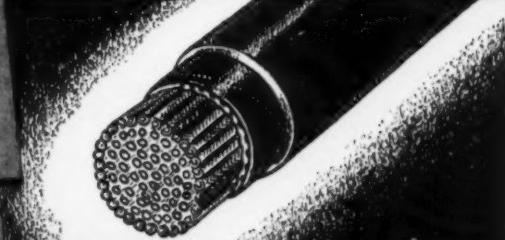
## HAZARD ARMORED CABLES, Type AC

Hazard Armored Cable has a flame-resisting, moisture-proof paper sheath between the conductors and spiral interlocked steel armor, a ripcord underneath the paper facilitates installation. Double protection is afforded by the insulating bushing which is inserted at the cut ends over the paper sheath instead of removing the paper as ordinarily done.



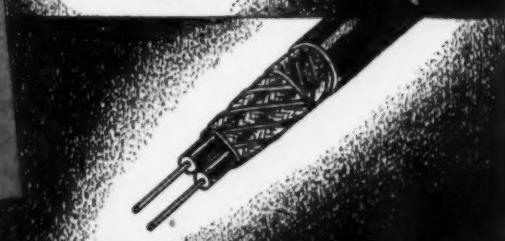
## HAZARD PERMEX

Thin-wall rubber insulation provides a means of constructing cables containing a maximum number of separately insulated conductors with minimum diameter and weight. It is used for multi-conductor telephone cables, for supervisory control, fire alarm, police signal or other low voltage circuits requiring many conductors in small compass because of limited duct space.



## TRIAL INSTALLATION CABLE (Interior Wiring)

CNX Covered Neutral Cable is designed for use in houses, buildings of frame construction and all types of farm buildings, including barns, garages, stables, etc. The rules which govern the installation of non-metallic sheathed cable also apply in a general way to the installation of CNX Covered Neutral Cable.



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**ELECTRIC SUPPLY CO.**

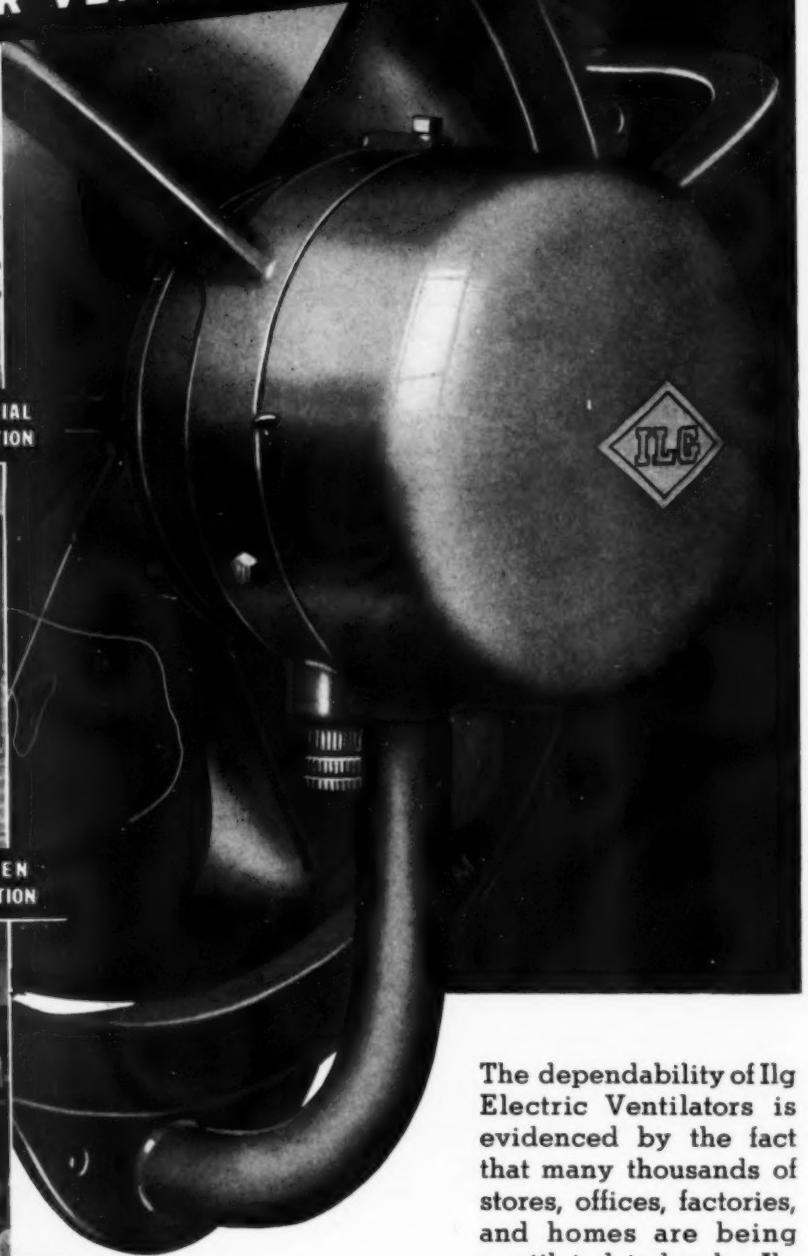
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*SELF COOLED MOT.*

# DEPEND ON ILG . . .

FOR YOUR VENTILATING NEEDS



The dependability of Ilg Electric Ventilators is evidenced by the fact that many thousands of stores, offices, factories, and homes are being ventilated today by Ilg Electric Ventilators.

The Ilg self-cooled motor, Ilg quiet operation, and undivided responsibility means that you, too, can DEPEND on Ilg for your ventilating needs.

*Send for handy pocket size booklet which gives complete information.*

**ILG**  
VENTILATING FANS

**ILG ELECTRIC VENTILATING CO.**  
2879 N. CRAWFORD AVE. CHICAGO, ILLINOIS  
*Offices in 43 Principal Cities*

Distributed by **WESTINGHOUSE**

**ELECTRIC SUPPLY CO.**

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Westinghouse Electric Supply Company

## Branches Carry PENN-UNION Stocks

The utmost in Convenience and Quick Delivery . . . for all users of Conductor Fittings . . . in the Penn-Union stocks carried by Westinghouse Electric Supply Company branches.

JUST A FEW of the THOUSANDS of items in the PENN-UNION line:



You're sure it's Dependable when it's a Penn-Union fitting. Every item carefully designed, thoroughly tested. Preferred by leading utilities and "industrials" for their Modernness . . . Time-Saving features . . . Uniform High Quality.

For all combinations of tube, bar, cable and wire—all sizes.

PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

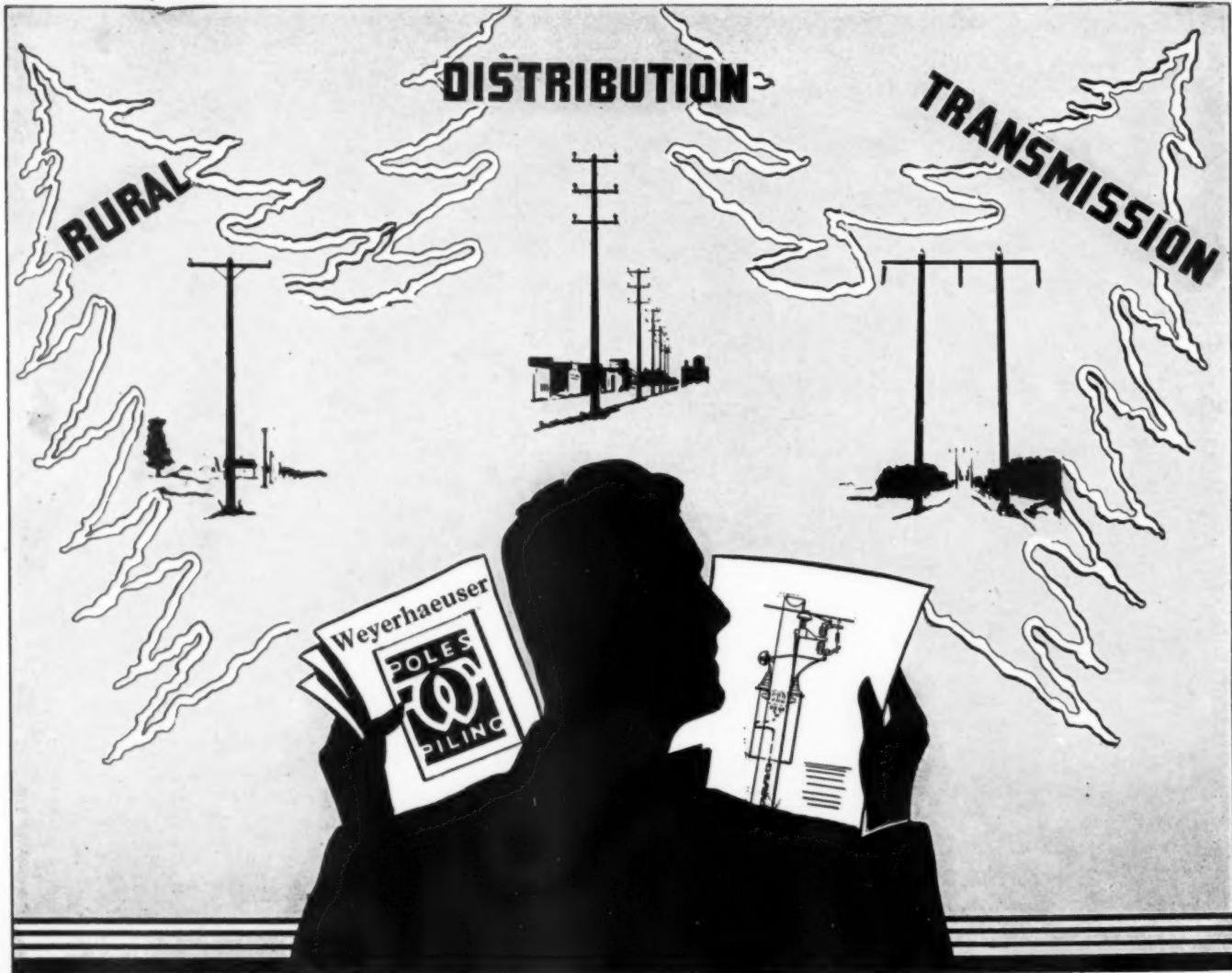
# PENN-UNION

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**AS YOU PUSH EVER DEEPER INTO NEW  
FRONTIERS--AS YOU PLAN REPLACEMENTS -----  
----- THINK OF Weyerhaeuser DEPENDABILITY**

WEYERHAEUSER  
1938

*Weyerhaeuser*

POLE COMPANY

Rand Tower, Minneapolis, Minnesota  
Western Office: Lewiston, Idaho

WEYERHAEUSER methods of selected cutting insure a sustained and assured supply of highest quality pole timber.

WEYERHAEUSER poles are selected from the largest and finest stands of privately-owned timber in the United States; finished and butt-treated under experienced and rigid inspection.

If the selection of good poles is your responsibility, write for your copy of the WEYERHAEUSER booklet.

*One Organization from Tree to Pole*

**WESTERN  
RED CEDAR  
POLES**

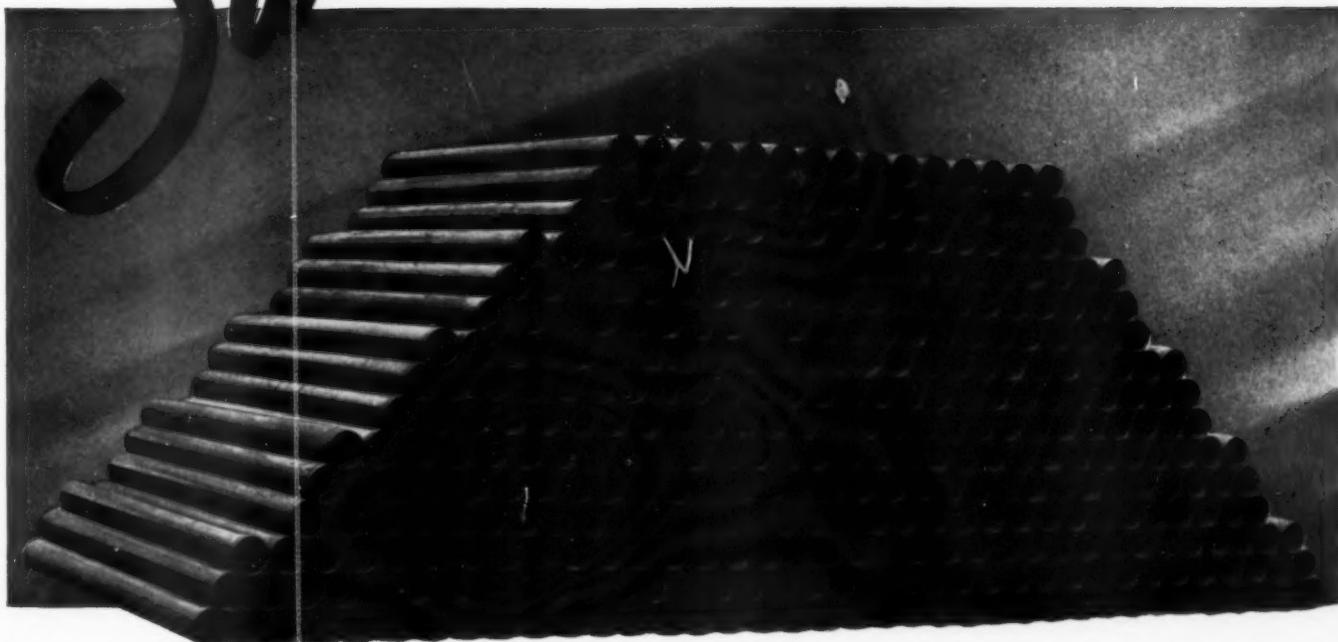
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# S<sup>E</sup> Save TIME—PROFITS



## With BERMICO FIBRE CONDUIT



### WHY THIS COUPLING CAN'T SPLIT

Driving forces tapered conduit ends solidly against fillet in center of coupling. Pressure is held on direct line through fillet. Ends cannot wedge and press outward to split the coupling.

Minutes quickly run into dollars on underground jobs. Leading contractors know that Bermico's time-saving advantages protect their profits.

Bermico's light weight makes handling easy and permits rapid laying-up in the trench. Precision milling of ends and couplings assure quick fitting, watertight joints. Installation is further speeded because the special Bermico coupling will not split under heavy driving... prevents grout seeping into duct... reduces rodding work... ends time losses involved in replacing broken couplings.

Tough virgin wood fibre gives Bermico exceptional strength... enables it to pass all underwriters' tests for fibre conduit with wide margins of safety.

Save time and profits on your next job with Bermico Fibre Conduit. Send for illustrated catalogue to Brown Company, 420 Lexington Ave., New York City.

**BROWN COMPANY**

FOREMOST PRODUCERS OF PURIFIED  CELLULOSES FOR QUALITY PRODUCTS

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**ELECTRIC SUPPLY CO.**

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BUY FROM **WESCO** AND INCREASE YOUR TODAY'S PROFITS

Wherever you are, there's a completely stocked branch within c

ALBANY, N. Y., 454 N. Pearl St.  
 ALLENTOWN, PA., 522 Maple St.  
 ATLANTA, GA., 96 Poplar St., N. W.  
 AUGUSTA, ME., 90 Water St.  
 BALTIMORE, MD., 40 S. Calvert St.  
 BANGOR, ME., 175 Broad St.  
 BINGHAMTON, N. Y., 87 Chenango  
 St.  
 BOSTON, MASS., 76 Pearl St.  
 BURLINGTON, VT., 208 Flynn Ave.  
 BUTTE, MONT., 50 E. Broadway  
 CHARLOTTE, N. C., 210 E. Sixth St.  
 CHICAGO, ILL., 113 North May St.  
 CLEVELAND, OHIO, 3950 Prospect  
 Ave.  
 COLUMBIA, S. C., 915 Lady St.  
 DALLAS, TEXAS, 409 Browder St.  
 DES MOINES, IOWA, 1400 Walnut  
 St.  
 DETROIT, MICH., 547 Harper Ave.  
 DULUTH, MINN., 308 W. Michigan  
 St.  
 EVANSVILLE, IND., 201 N. W. First  
 St.  
 FLINT, MICH., 1314 N. Saginaw St.  
 FORT WORTH, TEXAS, 501 Jones  
 St.  
 GRAND RAPIDS, MICH., 511 Monroe  
 Ave., N. W.  
 GREENVILLE, S. C., 226 Pendleton  
 St.

HOUSTON, TEXAS, 1903 Ruiz St.  
 INDIANAPOLIS IND., 137 S. Pennsylvania St.  
 JACKSONVILLE, FLA., 37 South Hogan  
 St.  
 LOS ANGELES, CALIF., 905 E. Second St.  
 MADISON, WISC., 1022 E. Washington  
 Ave.  
 MIAMI, FLA., 1036 N. Miami Ave.  
 MEMPHIS, TENN., 366 Madison Ave.  
 MILWAUKEE, WISC., 546 N. Broadway  
 MINNEAPOLIS, MINN., 215 S. Fourth  
 St.  
 NEWARK, N. J., 49 Liberty St.  
 NEW HAVEN, CONN., 240 Cedar St.  
 NEW YORK, N. Y., 150 Varick St.

**WESCO**

WHAT YOU NEED  
 WHEN YOU NEED IT  
 WHERE YOU NEED IT  
 FROM ONE  
 SOURCE OF SUPPLY

NORFOLK, VA., 320 City Hall Ave.  
 OAKLAND, CALIF., Tenth & Alice  
 Sts.  
 OKLAHOMA CITY, OKLA., 10 E  
 California St.  
 OMAHA, NEB., 117 N. Thirteenth St.  
 PELORIA, ILL., 104 East State St.  
 PHILADELPHIA, PA., 1101 Race St.  
 PHOENIX, ARIZONA, 315 West  
 Jackson St.  
 PORTLAND, OREGON, 134 N. W.  
 Eighth Ave.  
 PROVIDENCE, R. I., 66 Ship St.  
 RALEIGH, N. C., 322 S. Harrington  
 St.  
 READING, PA., 619 Spruce St.  
 RICHMOND, VA., 301 S. Fifth St.  
 ROANOKE, VA., 726 First St., S. E.  
 ROCHESTER, N. Y., 1048 University  
 Ave.  
 ST. LOUIS, MO., 1011 Spruce St.  
 ST. PAUL, MINN., 145 E. Fifth St.  
 SACRAMENTO, CAL., 20th & R Sts.  
 SALT LAKE CITY, UTAH, 235 West  
 South Temple St.  
 SAN ANTONIO, TEXAS, 1211 East  
 Houston St.  
 SAN FRANCISCO, CALIF., 260 Fifth  
 St.  
 SEATTLE, WASH., 558 First Ave., So.  
 SIOUX CITY, IOWA, 1005 Dace St.

SPOKANE, WASH., 152 So. Monroe St.  
 SPRINGFIELD, Mass., 46 Hampden St.  
 SYRACUSE, N. Y., 961 W. Genesee St.  
 TAMPA, FLA., 417 Ellamae St.  
 TERRE HAUTE, IND., 234 So. 3rd St.  
 TOLEDO, OHIO, 812 Lafayette St.  
 TRENTON, N. J., 245 N. Broad St.  
 TULSA, OKLA., 303 East Brady St.  
 UTICA, N. Y., 113 N. Genesee St.  
 WASHINGTON, D. C., 1216 K St., N. W.  
 WATERLOO, IOWA, 328 Jefferson St.  
 WICHITA, KAN., 233 South St. Francis  
 Ave.  
 WILMINGTON, DEL., 216 E. Second St.  
 WORCESTER, MASS., 24 Southbridge St.  
 YORK, PA., 143 S. George St.



**Westinghouse**  
**Electric Supply Company**

A National Distributing Organization

# Get the News

## MINNESOTANS HOLD SUMMER MEETINGS

Summer conference meetings of the Minnesota Electrical Association, Minnesota Electrical Council, North Central Associated Electrical Industries and Minnesota Electrical Inspectors Association, attracted 268 electrical men and their guests to the cooling breezes of Duluth, Minn., the end of July. The meeting opened with a six hour cruise of Lake Superior.

An Electrical Industry Conference, led by President W. S. Johnson, of the Minnesota Electrical Association, heard Victor H. Tousley, NFPA, V. E. Vining, Westinghouse, and W. C. Stephenson, of the Modern Kitchen Bureau. The Minnesota Electrical Council directed by President Louis H. Gordon heard Arthur Ingebretsen, of the Minnesota State Board of Electricity and J. Warner Pyles of REA. Mr. Pyles discussed farm wiring and introduced a new plan for awarding wiring contracts on future projects. The plan will establish unit prices in each project area after an agreement is reached with local contractors. Wm. G. Hazel talked on adequate profit margins.



**CERTIFICATE NUMBER ONE—**

Philadelphia has begun awarding adequate wiring certificates. Here B. Franklin Theobald, home builder, is receiving certificate Number One from T. V. Gargan, Chairman of the local A/W Bureau.

Following an industry luncheon, O. C. Small told of the business development work of NEMA. A. H. Kessler of the North Central Associated Electrical Industries discussed promotion work in Minnesota. Oscar F. Frykman, President of the Minnesota Electrical Inspectors Association, had the final session for code problems.

St. Paul, Minn., was selected by the directors as the location of the next winter meeting of these organizations to be held in February, 1939.

## CHICAGO TACKLES REWIRING

A cooperative attack on underwired homes is getting under way in Chicago, with the help of EFHA funds made available to homeowners.

A contract between the Commonwealth Edison Company and EFHA will provide time payment facilities, 10 per cent down and two years to pay, for balances of \$40 or more on rewiring work. Collections will be handled by Commonwealth Edison through customer light bills for work done by contractors.

These time payment and collection facilities will be offered to a select list of contractors. It is proposed that contractor qualifications shall include one or more salesmen devoting full time to the rewiring program.

District wiring operations will be set up with participating contractors, as in Chicago's outlet campaign.

## FREIGHT RATES ARE HIKE AGAIN

Contractors and dealers who make occasional allowances on their own to cover heavy freight shipments of electrical products need to re-adjust their data. Rates went up again on August 15, following a hike made in March 1937. Lamps, electrical machinery and appliances are affected by 10 per cent advances.

The Rail Carriers in Official Classification territory set up increases to become effective about August 15 as follows:

LCL-Item	From	To
Elec. Machinery	Class 40-L	Class 40
Elec. Appliances	Class 50	Class 55
Incandescent Lamps	Class 102	Class 110

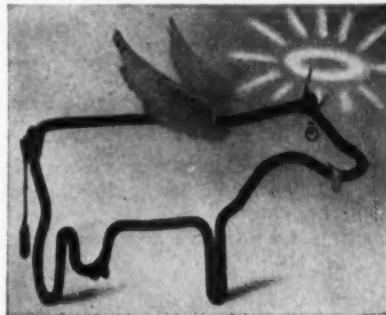
Shippers protests were presented at public hearings on these proposals held before a joint committee at Buffalo, N. Y., on June 13, 1938.

## STATUS OF NEW YORK "RACKET" LITIGATION

Numerous requests from other cities seem to call for a statement of the present status of the so-called "New York racket" litigation. Because it is still in the slow process of accusation and investigation, little has been reported here. Recent actions and the fact that the case has become of national interest, however, justify a further progress report.

There are two separate actions involved—

1. The National Electrical Manufacturers Association and 14 members companies, in suing the New York Local No. 3 of the International Brotherhood of Electrical Workers. The charge is violation of the Sherman anti-trust law. Hearings began



**THE SACRED COW SAYS—"Are you pushing No. 12 for branch circuits. Old No. 14 can't carry the load any more."**

Oct. 14, 1937, before a special master of New York City's Federal District Court. Testimony now bulks 7000 pages, given to show that this local union controls and dictates terms to the electrical construction industry of this, the greatest construction market in the country, though agreements with New York electrical manufacturers and contractors, that they have boycotted other manufacturers and given benefits to friendly manufacturers and contractors, through the power of strikes.

General Electric Company testifies that it sold \$500,000 in switchboards in New York City in 1933 and only \$179 in 1936. Westinghouse switchboard sales fell from \$244,173 in 1932 to \$3,629 in 1936. Meanwhile, the sales of 29 local manufacturers, which have an agreement with the union, have skyrocketed up to 693 percent, in some cases, between 1933 and 1937. They are alleged to have a high price for New York City, a low price for other sales.

Joseph Penner, a New York contractor, testified for 20 days against the union and the affiliated contractors association, of which the leading electrical contractors of the city are members. To simplify the case, NEMA and four manufacturers have now withdrawn. The union will begin presenting its case on September 13.

2. New York County District Attorney Thomas E. Dewey, in his crusade against rackets for two years, has been investigat-

ing alleged collusion between IBEW Local No. 3 and these local electrical manufacturers and contractors. He has taken their books and records and a special Grand Jury has been examining suspects. The following action has come out of it so far—

—On May 19, Percy L. Elias and George F. Price of Hofman and Elias Co., contractors, were sentenced to prison for 30 days and fined \$500 each, after pleading guilty to improper income tax returns.

—On July 14, Dewey called on Wall Street brokerage houses by subpoena to report all transactions with 87 persons and firms, members of local contracting, wholesaling and manufacturing firms under suspicion.

—On July 20, Horace W. Watts of McNutt, Watts & Tankard, contractors, was sentenced to 30 days in jail for evasive answers to the Grand Jury. Sentence was stayed on appeal.

—On Aug. 6, Benjamin Reiss, head of Berkshire Electrical Company, contractors, president of the Master Electric Contractors Association of Brooklyn, was sentenced to nine months in the penitentiary for perjury before the Grand Jury relating to bidding practice on electrical contracts.

It is impossible to say how long these two actions will continue before final indictments are brought in and the trial follows. Meanwhile the industry suffers the hurt of a scandal fast assuming national notoriety.

### CHANGES IN G-E SALES SECTIONS

A. E. Newman has been appointed manager of Wiring Material Sales for the Appliance and Merchandise Department,



**HEADS WIRING SALES**—A. E. Newman of G-E, Bridgeport.

General Electric Co., Bridgeport, Conn. F. A. Parnell has been appointed sales manager of the Conduit Section.

J. F. Farnam was made sales manager of wire and cable. Originally three different sections handled sales of wiring devices, conduit products and wire and cable. L. F. Giblin becomes supervisor of distribution development for wiring materials, J. P. McIlhenny will be sales manager of the Wiring Materials Field Organization, with office in Bridgeport. Mr. McIlhenny was formerly manager of District No. 5 of the Field Organization with headquarters in Chicago. George E. Wickman will fill this post.

Mr. Newman joined the Sprague Electric Company in 1910. He entered construction materials sales in 1923, was service manager and purchasing agent of the Lake States G-E house at Columbus, Ohio, and

later assistant sales manager of the G-E Supply Corporation house in charge of purchasing. He went to Pittsburgh in 1930 as sales manager of the pole line hardware division and in 1933 returned to Bridgeport as manager of conduit sales. In 1936 he became sales manager of both conduit and wire and cable when those two sales sections were consolidated. Last year he was made manager of the Conduit and Wire & Cable Sales Section.

### A/W AWARDS BEGIN

With Chattanooga, Seattle and Milwaukee recently licensed to certify wiring installations, the National Adequate Wiring Campaign is operating in fifteen cities.

The original cities to go A/W are now reporting their first homes as being certified. Initial adequate wiring awards have already been made in Philadelphia, Charlotte and Los Angeles.

New A/W activities include a complete and intensive program recently launched in Dallas, Tex. A six weeks school for contractors and wholesalers' salesmen is being planned for the purpose of studying the national wiring specification in detail.

Cincinnati has officially replaced its former Red Seal Wiring Program with the certification plan of the National Adequate Wiring Program. The Cincinnati Electrical Association will operate in Greater Cincinnati including all of Hamilton County, Ohio, and Canton and Campbell Counties, Kentucky. This area includes a total of 192,027 residential customers.

With a view of having inspectors completely informed about the Adequate Wiring Program, arrangements have been made for speakers to appear before the fall conventions of IAEI that are to be held in these cities:—Eastern Section—Baltimore; Southern Section—Jacksonville; Western Section—Cleveland; Northwestern Section—Spokane; and Southwestern Section—Long Beach.



**A/W ROLLING STOCK**—We've shown various people gathered around to talk up interest in local Adequate Wiring. But here is something different. The Grand Rapids Electric Club told Michigan folks about A/W by having its car and the trucks of members decorated to join in a local "Sales Mean Jobs" parade in that city.

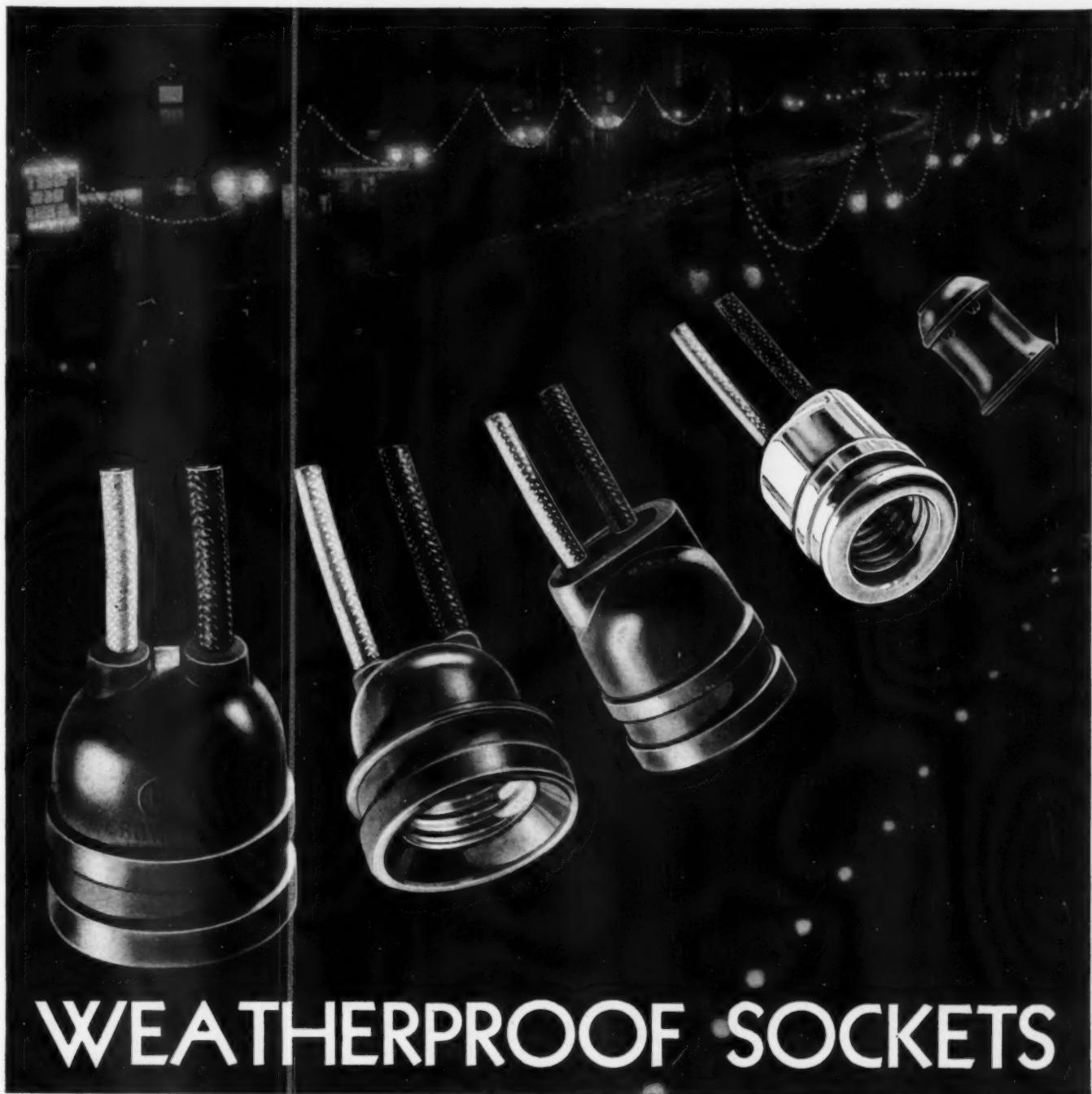
### REA PROGRESS

The Rural Electrification Administration has announced these allotments for wiring loans.

Kentucky—\$5,000 for customers in Christian, Todd, Logan and Simpson Counties.



"I'm having an electric eye put on the mail box — anything that looks like a bill it'll spit out."



## WEATHERPROOF SOCKETS

Designed for Holiday lighting, outdoor decorative and streamer work for municipal street lighting, decoration of home evergreens or outlines of porches or windows . . . Extremely practical for commercial and industrial uses under damp atmospheric conditions. These sockets withstand temperature changes and rough handling; have wire leads and shade-holder grooves with exception of the pin type. An improved wire-hanger is supplied with each pin type socket to hook over a supporting cable, to remove the

### ARROW

weight from the circuit wires. The pin type line has been amplified to include both the medium and intermediate base sizes for small or large wires. Also available with wire leads are Intermediate No. 483 and Candelabra No. 323.

Left to right above:—All-rubber (unbreakable), No. 1500; Bakelite, No. 43310-B; Composition, No. 60666; Porcelain, No. 9366; Pin Type of Bakelite, No. 43308. Order now for Holiday requirements with shipments specified during the rush season.

SOLD THROUGH YOUR

**ARROW ELECTRIC DIVISION**  
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

ELECTRICAL WHOLESALER

**"Thread-On" Users**

**GET THE WIRING JOBS**

Modern wiring methods cinch more jobs! Contractors and electricians who keep up with the fast-moving electrical industry quickly adopted "Thread-on" Connectors because they make wiring work safer — more economical. They replace the outdated, unreliable and laborious wire joints of our Grandfathers — which required blow torch, solder, tape, etc.

Patent No. 1,700,985

**APPLIED QUICKLY, EASILY**

No tools required. Convenient to use. Simply skin the wire ends and twist on a "Thread-on" — that's all!

**BETTER ELECTRICALLY — STRONGER MECHANICALLY**

Wires compressed tightly together, give perfect copper-to-copper contact — clean threads are pressed (not cut) into the wires, stranded or solid, assuring a doubly secure, permanent and trouble-free joint. Perfectly insulated — no more grounds and shorts through tape failures. Unaffected by heat, cold, moisture or acids.

**FULLY APPROVED**

Listed by Underwriters' Laboratories, Inc. and other electrical authorities. Approved by Electrical Inspectors, Architects and Owners, and used by thousands of Contractors and Electricians, etc.

**Millions in use**

**FREE SAMPLES**  
Write any of  
the five  
manufacturers  
listed.

**Molded "Thread-on" Connector**

**Conex "Thread-on" Connector**

**Porcelain "Thread-on" Connector**

**BRYANT ELECTRIC CO.,  
Bridgeport, Conn.  
(Manufacturing "Bryant" Connectors exclusively)**

**GENERAL ELECTRIC CO.,  
Bridgeport, Conn.  
(Manufacturing "G.E." Connectors exclusively)**

**IDEAL COMMUTATOR DRESSER CO.,  
Sycamore, Illinois.  
(Manufacturing "Ideal" and "Excel" Connectors exclusively)**

**WEISS & BIHELLER MFG. CORP.,  
504 Broadway, New York, N. Y.  
(Manufacturing "Simplex" and "Conex" Connectors exclusively)**

**WIREMOLD COMPANY,  
Hartford, Conn.  
(Manufacturing "Wiremold" Connectors exclusively)**

## In the News

[FROM PAGE 76]

Michigan — \$10,000 for customers in Van Buren, Kalamazoo, and Berrien Counties.

Minnesota — \$5,000 for customers in Douglas County.

Virginia — \$15,000 for customers in Mecklenburg County.

## NEMA RELEASES NEW FACTS

A new means of readily comparing the business trends in three important branches of the electrical industry comes out of research work by NEMA. The first of a series of monthly indices appeared recently, covering orders received for: motors and generators, industrial materials used in manufacturing electrical products (porcelain, laminated products, mica and fibre), and transmission and distribution equipment.

Using a 1936 average month as the index standard, there are tables for these three branches which cover operations for each month from January 1934. For quick reference, graphs have been prepared which show the same data in simple form, by months for 1937 and 1938, and quarterly for 1934 and 1935. With this data an individual manufacturing company can quickly compare its performance against the rest of its industry group. Other indices are planned for the future, particularly to cover the appliance field, and another covering construction materials.

## NEW SAN FRANCISCO OFFICERS

The San Francisco Electrical Contractors' Association held a special election August 11, at which time Walter Spencer, Spencer Electric Co., San Francisco and Oakland, was elected president and George Abbott, of Abbott Electric Co., San Francisco, was elected vice-president.

## LOS ANGELES UNITES FOR ACTION

Reorganization of several associations into the Los Angeles chapter of the NECA, and the launching of a modernization drive, is virtually complete in southern California. The new organization began with 39 members, paid up for three months, at the meeting of July 18.

Roy Gruendler, formerly field representative for the California Electrical Contractors Exchange, has been retained as field man for the chapter and for NECA in southern California. A commitment from the Electrical Development League of Southern California for the launching of the modernization program is to be matched by the contractors. The league will handle the advertising and details of the program on behalf of the industry.

**MULTIPLE FLOODLIGHT**

No. 84K

**DUPLEX DOME**

**VAPOR PROOF FIXTURES AND REFLECTORS**

QUAD  
No. 694JL

**POST TOP REFLECTOR**

**DOME REFLECTOR FOR MERCURY VAPOR**

**QUAD IS THE ANSWER**  
**"YES SIR"**

**CONTRACTORS**  
**HERE, THERE AND**  
**EVERYWHERE ARE PROF-**  
**ITING THROUGH EXPERIENCE**

The call keeps coming for Quad lighting units both for indoor and outdoor industrial and commercial needs and contractors are realizing more profit as they install more Quads.

Contractors like Quad units because they are flexible in design, easy to wire and install and make satisfied customers. Experience proves this time and time again.

Your customers will like Quad units because of their high lighting efficiency, their ease of maintenance, their strong construction, their fine appearance and because their high initial illuminating qualities do not lessen. Experience proves this, too.

Go after those installations backed by Quad and land those profitable jobs. Where you encounter an installation on which you would like help, just get in touch with us and we'll gladly help.

**QUADRANGLE**  
**MFG. CO.**  
**32 S. PEORIA ST., CHICAGO, ILL.**

# *They'll buy* **GLARELESS LIGHTING** *Sooner!*



**THE CAPITOL**

• The merchandising of modern lighting, for decorating purposes as well as visual efficiency, has been simplified and speeded up by Art Metal's newest line of fixtures and cooperative literature, described below.

For instance: THE CAPITOL, "last word" in a glass luminous bowl for better lighting, is shown at the left. Its design produces a wide upward distribution of light to "shower" the illumination throughout the interior. High reflection and low absorption factors prevent needless loss of light.

This is only one of many new models pictured and described in the two Art Metal Light Conditioning manuals. One, or both, will be sent to you FREE! Mail coupon below.

**START MAKING MORE MONEY....**  
by sending for these **FREE** sales aids **TODAY!**

**THE ART METAL COMPANY, Cleveland, Ohio**

*Please send me (check one, or both if desired):*

- "FASHIONS IN LIGHTING"—a valuable sales aid in showing home owners how Light Conditioning not only aids sight, but adds charm and beauty to every room in the house.
- "LIGHTING CREATIONS"—a factual booklet, showing "before and after" pictures of the benefits of modernized lighting, which you can use on commercial prospects as an "opening wedge" and effective "sales clincher."

Name .....

Company .....

Street .....

City ..... State ..... EC-9

*In the News*

[FROM PAGE 78]

Officers of the new chapter, elected at the meeting June 30, include A. L. Stone as president, Clare Smallcomb vice-president, and J. B. Shamel as treasurer. Directors are Roy Littlejohn, Claire J. Bennett, R. R. Jones, and J. E. Irwin. Joe Newitt is executive secretary.

## **NISA COMMITTEEMAN ANNOUNCED**

The personnel of six major committees of the National Industrial Service Assn. were recently announced. Excepting those stated otherwise, all committeemen are appointed for the current year.

Committee on Certified Electrical Shops: F. W. Willey, Chairman, Cincinnati, W. W. Hanks, Charlotte, E. P. James, Chicago, E. C. W. Johnson, Indianapolis, G. P. Svendsen, Minneapolis, W. J. Wheeler, New York, and J. E. Launder, ex-officio, Kansas City.

Trade Relations Committee: W. J. Wheeler, Chairman, New York, C. A. Sievert, Chicago, E. C. W. Johnson, Indianapolis, and J. E. Launder, Kansas City.

Cost Data Committee: P. G. Winter, Chairman, Indianapolis, Wm. C. Krauth, Louisville, A. L. Brown, Worcester, H. H. Roessle, Pittsburgh, and G. P. Svendsen, Minneapolis.

Committee on Public Relations: W. W. Hanks, Chairman, Charlotte, L. Bonnecaze, Jr., New Orleans, and Wm. J. Wheeler, New York.

Rebuilt Equipment Committee: C. A. Sievert, Chairman, Chicago, F. M. Mielke, Duluth, and J. M. Pilmer, Des Moines.

Auditing Committee: L. Bonnecaze, Jr., New Orleans, W. G. Hoffman, Knoxville, and Chas. Kaska, Chicago.



**DETROIT SHOPMAN**—When Detroit's Electrical Repair Association was formed in 1933, about fifteen firms joined. Now there are about 30 members, comprising the leading motor service shops. They pay no dues. Marshall G. Pearce of the Fife-Pearce Electric Co. is president of the association.

If you are interested  
in A MORE  
WIDESPREAD  
and  
SAFER USE  
of ELECTRICITY



• • • investigate the FUSTAT!

The long time-lag of the Fustat keeps it from popping out and shutting down the circuit when motors start on washing machines, refrigerators or other such appliances.

This means that a user can keep adding more appliances to present circuits until the load is equal to the approved carrying capacity of his wiring — with perfect safety and without incurring needless blowing.

**Prevents hazardous burnout of flexible cords,  
in spite of long time-lag**



The Fustat contains a fuse. The ability of a fuse to protect against dangerous cord shorts, grounded sockets, etc., is well known.

The quick action of the Fustat on such dangerous "household shorts" prevents spraying of molten metal, starting of fires, burning of users.

**Protects against**

**dangerous overloading of circuits**

An overload even as light as 25%, if continued, will cause the Fustat to open and protect the circuit. Once the right size Fustat is installed permanent overloading is positively prevented.

**Keeps the circuit from being  
robbed of protection**

A Fustat cannot be replaced with a penny nor any such substitute — nor with a size too large to protect. In fact sidetracking protection in any way is practically impossible without destroying the Fustat or adapter and thereby clearly showing the user that all protection is gone.

The Fustat guards against anyone unwittingly creating a fire or injury risk thru haphazard practices.

If additional circuits are needed the user cannot readily side-step the issue at the sacrifice of safety.



**Reduces loss of time and money**

**on needless "blown-fuse" service calls**

When a fuse blows on a starting current everybody loses. The user's service is off . . . the service man may be dragged away from more profitable work . . . the full cost of the call may not be collected if the user kicks about paying it just to have a fuse changed . . . the whole electrical industry loses because needless interruptions of service are costly, annoying and unnecessary. The Fustat stops this senseless waste by eliminating such "false-alarm" service calls.



Fits present  
fuseholders

Retails  
at 7½¢



Retails at  
**7½¢**  
in 15 to 30 amp. sizes

Thru the use of an inexpensive adapter that locks in place, the Fustat fits in any standard Edison base fuseholder.

On new jobs, you can specify that panels, switches, etc., be equipped with Fustat bases.



For safe and trouble-free protection it's just good business to sell, install and use Fustats

# The FUSTAT

FOR FULL INFORMATION WRITE TO ANY OF THESE FIRMS

BUSSMANN MFG. CO. University at Jefferson, St. Louis, Mo.	JEFFERSON ELEC. CO. Bellwood, Ill.	KIRKMAN ENG. CORP. 121 Sixth Ave., New York City	NATIONAL ELEC. PDTS. CORP. Fulton Bldg., Pittsburgh, Pa.	UNION INSULATING CO. 277 Broadway, New York City
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## In the News

[FROM PAGE 80]

### NEW CHICAGO CODE ADOPTED

The Chicago City Council approved a revised edition of the Chicago Electrical Code on August 3, to become effective as soon as printing and distribution are complete.

The most important changes from the 1931 revision pertain to wiring systems developed since that time. Rules covering the installation of thin wall conduit, wireways and bus-ways, and cellular steel floors are new in this edition. These wiring systems have heretofore required special permits.

The new code was prepared by the Chicago Electrical Commission, headed by C. K. Cregier, Chief Electrical Inspector, J. J. Chapp, Crescent Engineering Company; Walter Jasper, I.B.E.W.; John A. Neil, Fire Underwriters and K. P. Willerton, Commonwealth Edison Company.



**SAFETY PLEADER**—A vigorous condemnation of attempts to reduce standards of safety in electrical wiring was the contribution of A. J. McGivern of the Chicago Electrical Wholesalers Association in a talk before the Indiana-Illinois Chapter meeting of IAEI in Gary Indiana. Also present was J. Walter Collins (left) veteran Secretary-Manager of the Chicago Electrical Contractors Association.

### ORGANIZE FOR SMALL-JOB ENGINEERING

Contractors and wholesalers of San Diego, Calif., are offering an engineering service on electrical wiring plans and specifications for average jobs where the services of consulting electrical engineers are not generally employed. The San Diego office of the Biddle Trade Bureau, has engaged H. W. Reichle, a retired electrical contractor and engineer from Pittsburgh to carry on this work. Part of the service includes inspection of the job to see that it goes in as specified. Benefits expected from this service are: Estimating time



## WE ARE PRESENTING HIM as an ADEQUATE Wiring Expert!

AND BACKING HIM UP  
WITH THE FACTS

The industry wide ADEQUATE WIRING CAMPAIGN is focusing attention on the Electrical Contractor, who knows his Wiremold Technic (commonly called "WBB"—short for "Wiremold Business Builder"). Because he is the man who actually does the work.

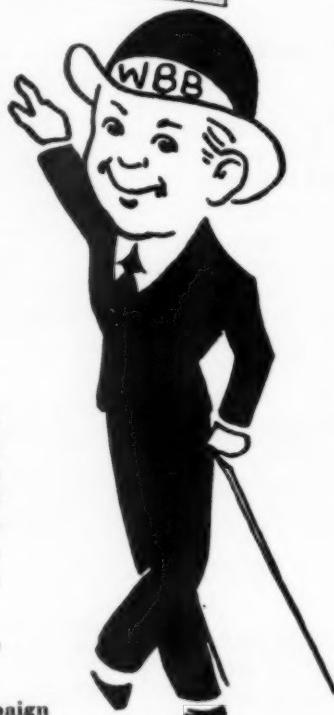
And Wiremold is helping him make the most of it.

**FIRST** By an advertising campaign which sells him to the building trades.

**SECOND** By an engineering data service which gives him expert counsel when he wants it.

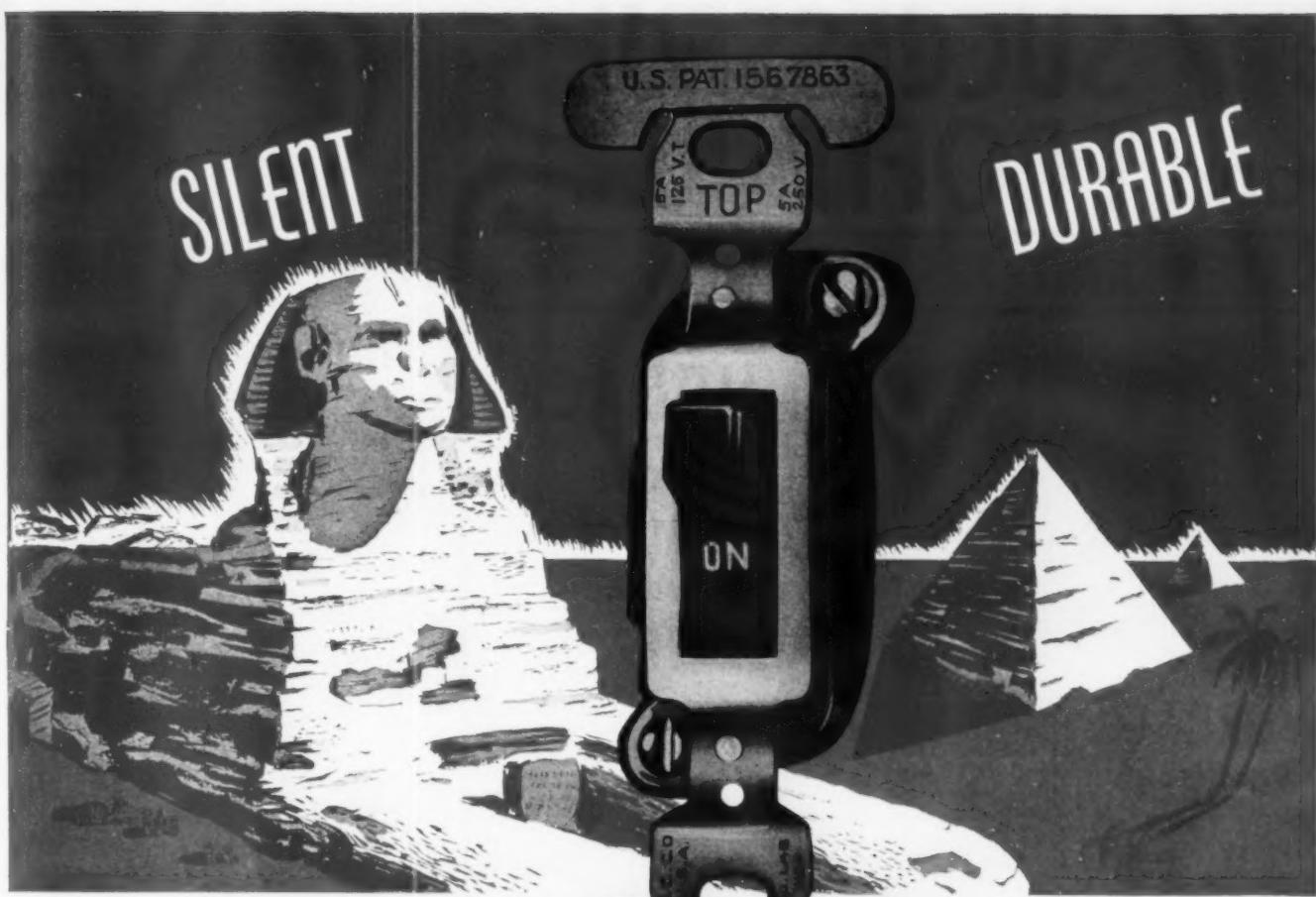
Write for details. Keep in touch with

**THE WIREMOLD COMPANY**  
HARTFORD, CONN.



### SEND IN YOUR NAME

To Wiremold Engineering Department to Receive Latest Layouts and Data Sheets as They Are Issued.



## "SPHINX" MERCURY FLUSH SWITCH

Now, a silent switch—the G-E "Sphinx" Mercury Flush Switch—in all standard types! Cushioned action—practically no noise on the make or break. Long life—no spring to break, no blades to hammer away—literally nothing to wear out.

Compare the features of this switch with those of the standard spring action switch:

1. Silent operation—practically no noise on the make or break.
2. Long life—no spring to break, no blades to hammer away.
3. Large binding screws, with heads that readily accommodate #12 wire.
4. Wide mounting ears that line the switch up on mounting surface without extra leveling means such as screws or washers.

5. Textolite casing, with arc completely enclosed in a glass-sealed metal button.
6. Textolite switch handle, either brown or ivory, with "on" and "off" markings.
7. Switch is for vertical mounting only—"top" on one support indicates correct mounting position.
8. Ratings: 5 amp., 250 volts; 5 amp., 125 volts, T, (T rating on 125 volts only) AC or DC.

The standard-type line is complete, with single-pole, double-pole, three-way and four-way switches that can be installed in any standard switch box. Approved by Underwriters' Laboratories.

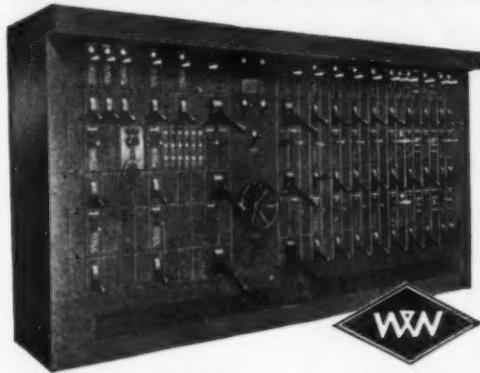
For complete information, see your nearest G-E Merchandise Distributor, or write today to Section CDW-8179, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Connecticut.

**GENERAL**  **ELECTRIC**

WIRING DEVICES

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

# \*\*\* SUCCESSFUL and PROFITABLE SALES AND INSTALLATIONS . . .



## WURDACK REMOTE CONTROL STAGE SWITCHBOARDS

### WURDACK Deadfront Switchboards

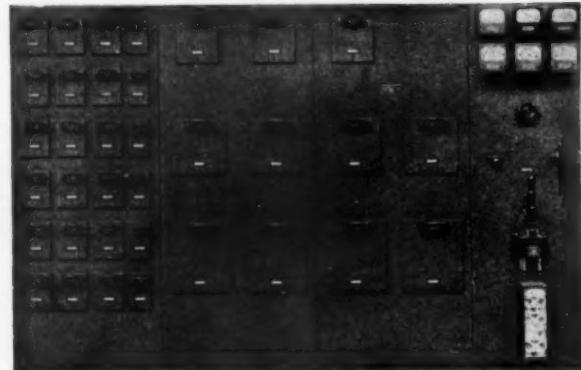
Of the Auto Shift Type are constructed of one-piece cold rolled steel panels with openings cut for individual Auto Shift Switch Units. These units are so constructed that all parts are dead when door is open. Fuses are mounted on insulated bases on back of steel inclosure eliminating all heavy parts from door.

A complete line of Dead Front Lighting Panelboards, constructed of standardized sections of molded Bakelite. All switches and fuse receptacles are readily removable from front of panel. All Cabinets made of Code Gauge Galvanized Steel. Fronts of full finished cold rolled steel, rust-proofed with black lacquered finish.

### WM. WURDACK ELECTRIC MFG. CO.

*General Office and Factory*

4444 Clayton Avenue      St. Louis, Mo.  
SALES OFFICES IN PRINCIPAL CITIES



*When you install*

## WURDACK EQUIPMENT

*you insure a modern job . . .*

\* THE UTMOST IN CONVENIENCE  
\* COMPLETE DEPENDABILITY  
\* ALL AROUND SATISFACTION

*In the News*

[FROM PAGE 82]

saved for contractors, more definite specifications, cleaner competition, owner protection, architects relieved of inspecting the electrical job, better quality of materials, and more adequate wiring installations.

### TORONTO TAKES A BOW

Toronto announces its 25,000th "Red Seal" wired home. This job was finished in May, with 133 outlets for an eight room house. So far this year 285 "Red Seal" homes have been listed.

### CAESAR TO NEMA APPLIANCE SECTION

A. H. Caesar, Jr., was recently appointed executive secretary of the Domestic Appliance Section of the National Electrical Manufacturers Association. He has been a member of the NEMA Staff for several years, serving as executive secretary of the Radio Apparatus and Electronic Tubes Section.

### COMING MEETINGS

**International Association of Electrical Inspectors—Eastern Section, Baltimore, Md., Sept. 6-8; Southern Section, Jacksonville, Fla., Sept. 12-14; Western Section, Cleveland, Ohio, Sept. 19-20; Northwestern Section, Hotel Davenport, Spokane, Wash., Oct. 3-6; Southwestern Section, Long Beach, Calif., Oct. 10-12.**

**National Electrical Contractors Association—Annual convention, Book-Cadillac Hotel, Detroit, Mich., Sept. 12-15.**

**International Municipal Signal Association—Lord Baltimore Hotel, Baltimore, Md., Sept. 12-15.**

**Ohio Electrical Contractors Association—Annual Meeting, Cincinnati, Ohio, Oct. 18-20.**

**National Electrical Wholesalers Association—Semi-annual Convention, Drake Hotel, Chicago, Oct. 18-21.**

**National Electrical Manufacturers Association—Annual conference, Palmer House, Chicago, Ill., Oct. 24-28.**

### NEW MARKET FOR RACEWAY WORK

Concealed telephone wiring in both new and old residences has been fostered successfully by the New England Telephone & Telegraph Company beginning with 1937, through co-operation with architects, builders, and electrical contractors in the five states served by this organization. In 18 months 1,410 home buildings have been equipped with interior conduits and set cabinets (1,029 with interior conduits alone). According to representative contractors, this business has yielded extra revenue of real value. The work can be done at the same time that other electric service wiring is installed, and in typical cases adds from \$3 to \$10 or even more to the contractor's income from a specific wiring job.

**PANTHER**

CELLOPHANE WRAPPED

**PANTHER**

**FRICITION TAPE**

**3/4" HAZARD INSULATED WIRE WORKS**  
**DIVISION OF THE OKONITE COMPANY** No 8

MADE to be Wrapped and STAYS in Cellophane  
 Perfect Adhesiveness and Tensile Strength  
 Strong Distinctive Green Color  
 Colorful Attractive Boxes  
 A Company in the Insulation Business Since 1878

**PANTHER DRAGON TAPES**

**DRAGON**

**NET WTGHT. FRICITION TAPE**

**3/4" HAZARD INSULATED WIRE WORKS**  
**DIVISION OF THE OKONITE COMPANY**

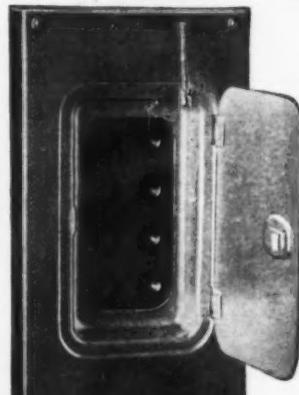
**HAZARD INSULATED WIRE WORKS**  
**DIVISION OF THE OKONITE CO**  
 WORKS: WILKES-BARRE, PENNSYLVANIA

New York	Chicago	Philadelphia	Atlanta	Pittsburgh	Buffalo	Boston	Detroit
Seattle	Dallas	Washington		San Francisco	St. Louis	Los Angeles	

H



6 Circuit FUSE GROUP  
Flush Type



6 Circuit FUSE GROUP Surface Type

## Who Said It Couldn't Be Done Better?

Yes! Who said that Service Entrance Panels couldn't be built better without a big increase in price? We said it once, and so did lots of others. But we were all badly mistaken for it has been done, and in a big way, by our engineers. The demand for Walker Electrical Company quality products has permitted us to re-design our line of fuse groups.

This new quality fuse group surpasses anything on the market. It has every desirable feature without a single undesirable one—every detail has been worked out to perfection. The design is so attractive and compact it can be placed anywhere to add a touch of decorative beauty to the job. Bring your wiring jobs up-to-date with WALKER quality products. Our price is right.

*Write today for complete information*

**WALKER**  
ELECTRICAL COMPANY  
ATLANTA, GA.

*In the News*

[FROM PAGE 84]

The New England company promoted this development in a small way at first by making contacts with owners. Records showed that over 80 per cent of the prospects called on favored the use of concealed wiring, and actually about 41 per cent of the 3,485 buildings considered have signed up for raceway installations. The telephone company pulls in wire and cable with its own forces as a part of the communication engineering construction required. The additional cost is small compared with the outlay for other wiring. In general, raceways of  $\frac{1}{2}$  or  $\frac{3}{4}$  in. diameter suffice for this work. Several hundred electrical contractors in New England have participated in bids during the last year and a half.

The telephone company has prepared an attractive folder for popular use featuring the benefits of underground and concealed wiring in connection with its service, and in the near future will have a compact working manual for the use of architects and wiring contractors.



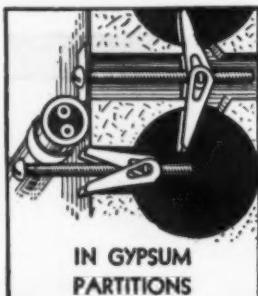
## HERE IS THE IT TOGGLE WITH

—the toggle that works in Gypsum or Machalite. Paine Toggles work in any hollow place, in any position—AND INSTANTLY.

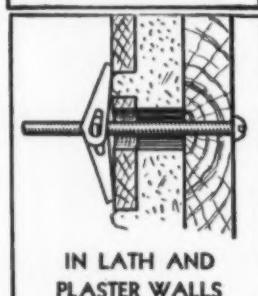
### PIPE STRAPS



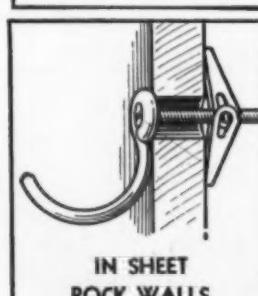
They go right along with Paine Toggles. Paine Pipe Straps have that prominent center rib that gives them giant strength—and they go over big because of their uniform gauge, smooth finish and snug fit—both the 1-hole and the 2-hole type.



IN GYPSUM PARTITIONS



IN LATH AND PLASTER WALLS

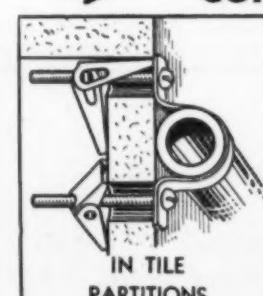


IN SHEET ROCK WALLS

**THE PAIN COMPANY**

Dept. 589  
2947 Carroll Ave.,  
CHICAGO  
79 Barclay Street  
NEW YORK

**SEND TODAY**



IN TILE PARTITIONS

### HEADS INDUSTRIAL CAMPAIGN

—When Kansas City's electrical industry saw industrial electrification slowing down, the Electrical Association organized to revive interest. So the all-industry Industrial Wiring Committee, with W. T. McAuley, electrical contractor as chairman, began a campaign of folders, return cards, and close personal follow up by participating contracting firms.

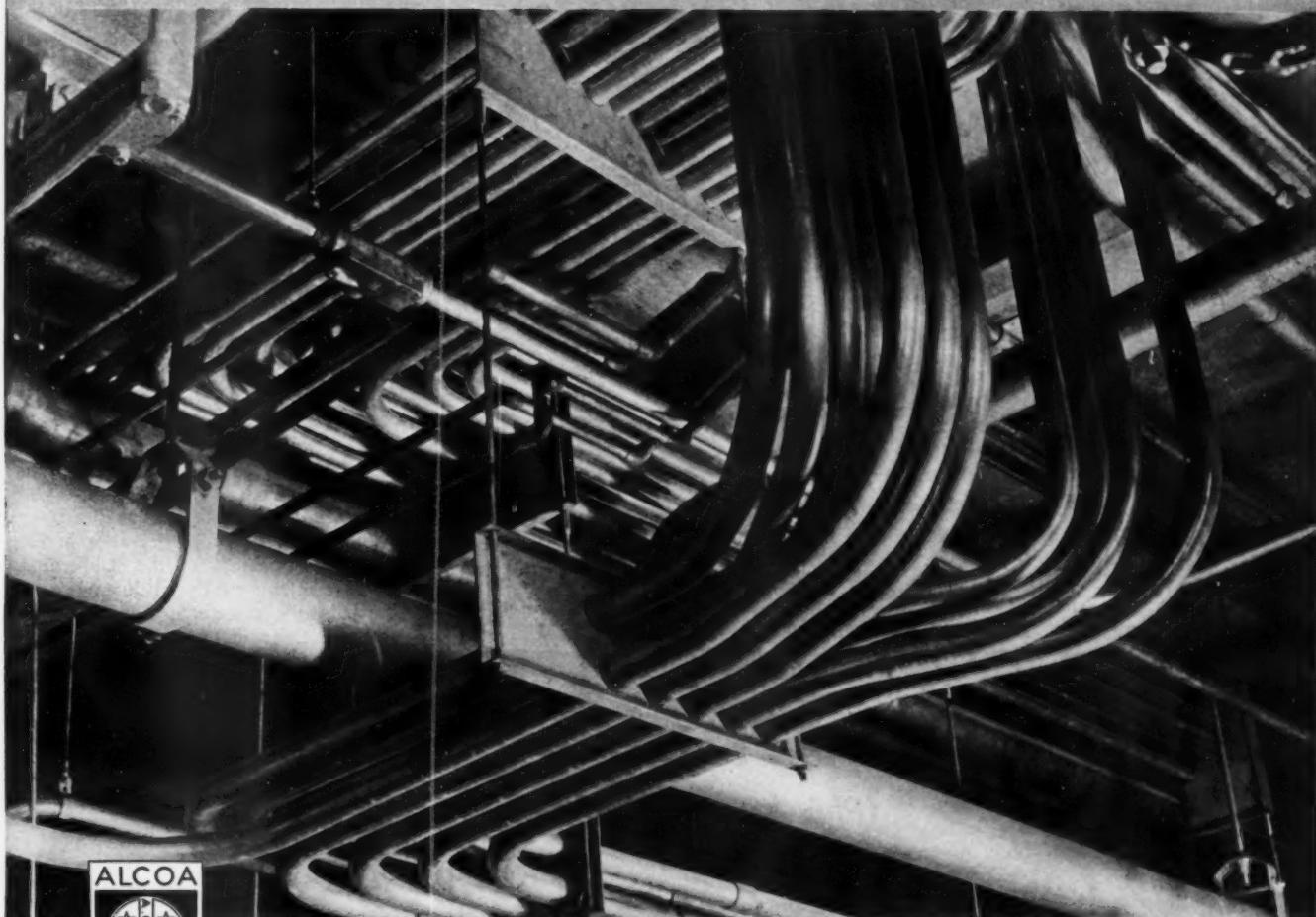
### IDAHO STEPS OUT

To consolidate the benefits of a recent apprenticeship training course on wiring, electrical contractors and the electrical industry generally in Idaho held a meeting recently at which a permanent organization was formed. Delegates from Pocatello, Twin Falls, Jerome, Payette, Caldwell and Boise attended the organization committee meeting. By-laws were drawn and adopted. C. D. Purkhiser, of Caldwell, Idaho, was

84]

IF IT'S CONDUIT YOU'RE BUYING (where Corrosion is a Problem)

*specify Alcoa Aluminum Tubing*



The electrical conduit shown above, in the blower building of a sewage disposal plant, is Alcoa Aluminum.

Six years ago, Alcoa Aluminum conduit was installed in an underground gallery at this sewage disposal plant. Today, although other piping and hangers in this same location appear to be in poor condition, the Aluminum is bright and undamaged by corrosion.

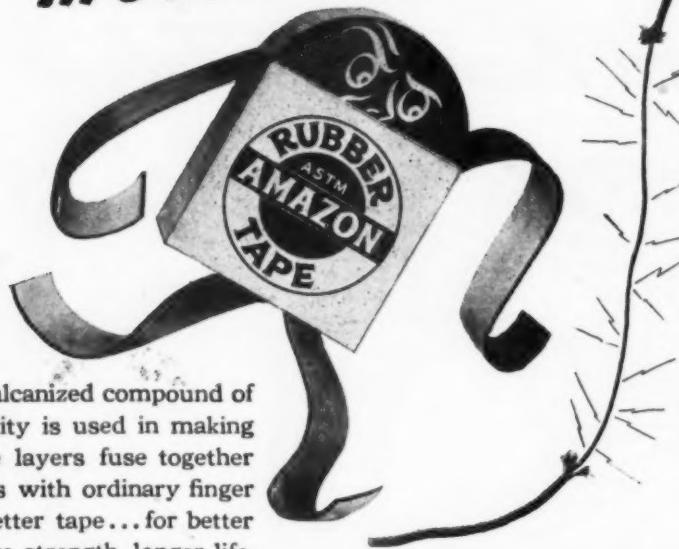
Appearances are an important factor in private as well as public properties. Equipment must have that well-cared-for look at all times. Aluminum, in addition to staying serviceable year after year under such corrosive conditions as these, retains its bright newness with minimum maintenance. That is why it pays to consider Aluminum wherever corrosion is a problem.

Alcoa Aluminum tubing is readily formed

for the twists and turns required in conduit work. Its installation is no problem. May we quote you on your conduit requirements? Aluminum Company of America, 2197 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA  
ALUMINUM

**"I'LL INSULATE YOU...  
...COMPLETELY!"**



Partially unvulcanized compound of the finest quality is used in making this tape. The layers fuse together in a solid mass with ordinary finger pressure. A better tape...for better insulation, more strength, longer life.

**RUBBER TAPE** *AMAZON-VICTOR-*  
Distributed by **Graybar**  
OFFICES IN 85 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

*In the News*

[FROM PAGE 86]

elected president, W. A. Hopper, of Boise, vice-president, and J. C. Baldridge of Boise, secretary-treasurer. Additional vice-presidents were elected for each of the four districts in which the regular meetings are to be conducted. Five classifications of members were provided for: contractors with shops, contractors without shops, journeymen wiremen, power utilities, manufacturers and wholesalers. The territory was divided into four districts and about 125 members started the organization. It is planned to carry on an advertising program using the National Adequate Wiring promotion material.

#### **WATER HEATERS IN PORTLAND**

Portland General Electric Co. and Northwestern Electric Co., Portland, Ore., announce that henceforth they will sell electric water heaters at manufacturers' suggested list prices. Also, they will carry the installation cost for the purchasers of water heaters from any dealer at \$1.00 down and \$1.00 a month. This means an increase of from 10 to 15 per cent in the price of water heaters to the public, but the increase in the merchandising mark-up is expected to stimulate appliance dealers to greater activity in this line.

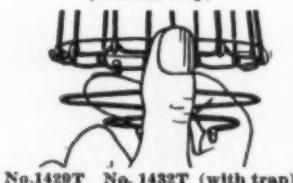
In a normal installation, the wiring amounts to \$14.50 and the plumbing to \$7.00. Utility companies contract the wiring to established electrical contractors, but do their own plumbing.

#### **MCGILL—Complete Protection**

##### **(Plus Accessibility)**



No. 1429 No. 1432  
(without trap)



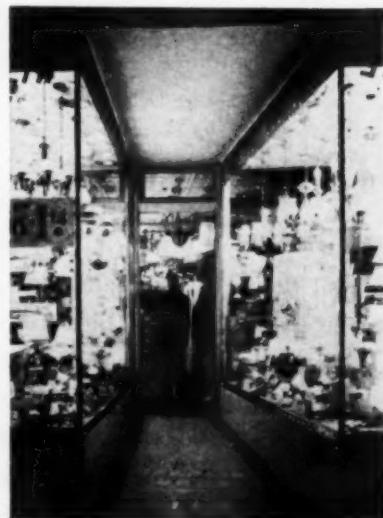
Here is the ideal lamp guard for use wherever thorough protection is wanted not only against lamp breakage, but against unauthorized removal of lamps as well, when desired. Simply by snapping the wire trap onto the base of the guard, the guard is completely closed, yet the trap is easily removed to permit changing or cleaning of lamps. The guard is held securely by screws.

No. 1429 (without trap) is made for brass sockets, No. 1432 (without trap) for weatherproof sockets. Both are for 25 to 60 watt lamps. Same, with trap, are No. 1429-T and No. 1432-T. Trap alone is No. 2932. Order from your wholesaler.

**Left:** To remove or replace trap at base, simply press inward on the guard rim where the trap hooks onto it, and snap the trap on or off as desired.

**MCGILL MANUFACTURING COMPANY**  
Electrical Specialties of Quality  
VALPARAISO, IND.

Box No. 670



**TRENTON MODERNIZES** — The Sharlin Brothers made it a point to know Trenton, N.J., merchants and their lighting needs. Sharlin lines of commercial luminaires are going up in good numbers to replace old-timers. This is due largely to hard work by Hiller Sharlin, standing at the right. Brother Louis is next, while a third brother, Abraham, eases behind the door.

# ALL PORCELAIN ILLINOIS SYSTEMS

ARE EASY TO INSTALL AND MEET ALL NEEDS.....



## STANDARD TUBES

In sizes  $\frac{1}{2}$  to 48 inches long  
5/16 to 3 inch diameter in following types; unglazed, glazed, split, floor, split floor, headless, curved end, cross over split, and crossover. Diameters all uniform both inside and outside.

When you sell wiring, be sure you sell an All Porcelain Illinois System.

It means your customers get fully modern wiring and complete dependability with safety.

It means greater economy for your customers, savings for you and too, you build your prestige for efficiency.

This system is available for residential and farm wiring.

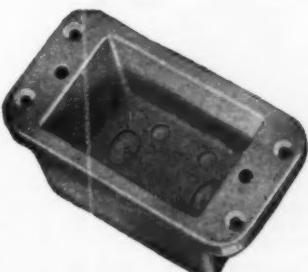
Use it where dampness and fire hazards are prevalent — such as in warehouses, cold storage and packing plants, dairies, chemical works, ice plants, breweries, etc., and especially in residences. No grounding necessary. Porcelain boxes require no clamps. No rusting or corrosion.

**Send for Bulletin**



## KNOBS

Cement coated — extra length nail — genuine leather washer — code standard. They don't chip when driven in and they do stay in place and have a firm grip. Available in a wide variety of heights, diameters, holes, and grooves.

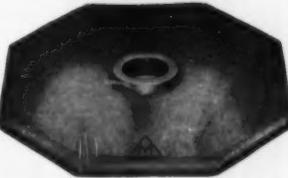
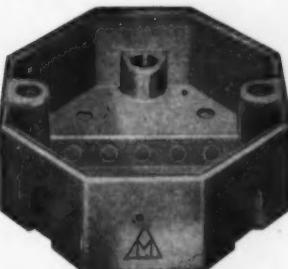


## SWITCH BOXES



## OUTLET BOXES

Insure greater safety in wiring and the elimination of all grounding hazards. Made of the best quality of white porcelain. Metal inserts are placed in two holes of the switch boxes for receiving screws of standard switches, plug outlets, etc. Knockouts for single wires, also for cables. Specify and use them.



Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.



Profit  
BY

Using

ILLINOIS  
AS YOUR SOURCE  
OF SUPPLY

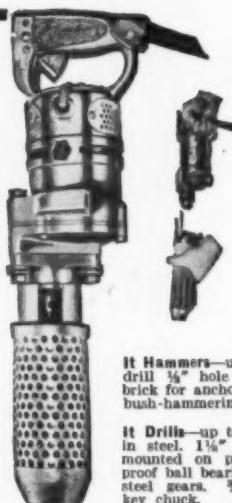
ILLINOIS ELECTRIC PORCELAIN CO.  
MACOMB, ILLINOIS

to standardize on —

# ILLINOIS

— is a Progressive Step

A "3-PURPOSE TOOL" THAT  
CONTRACTORS HAVE DREAMED OF . . .



## THE MILWAUKEE— HAMMER-DRILL

Cuts time and labor costs on more jobs

More jobs at larger profits on each—that's what this handy, fast-working tool will do for you. Full ball bearing construction. Furnished complete with sturdy, wooden carrying case.  $\frac{3}{4}$ " Jacob chuck and key, special taper tool chuck one  $\frac{1}{4}$ " star drill, 12-ft. 3-wire heavy duty rubber cable, and tool retaining spring. Universal motor for D. C. or A. C. 25, 40, or 60 cycles. Furnished with 32, 110, 150, 220, or 250-volt motor as specified. If your Jobber doesn't yet handle this widely used tool write us direct.

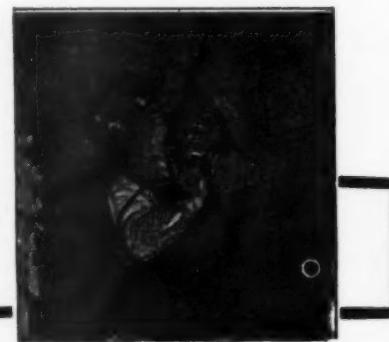
**It Hammers**—up to  $1\frac{1}{4}$ " diameter holes in concrete when using a hollow drill. Will drill  $\frac{3}{4}$ " hole  $4\frac{1}{2}$ " deep in one minute. Use it for drilling holes in concrete or brick for anchoring expansion bolts, for scaling rust, channelling, seaming, vibrating, bush-hammering, caulking, etc.

**It Drills**—up to  $5/16$ " diameter holes in steel.  $1\frac{1}{4}$ " in wood. Every shaft mounted on precision oil-seal, dirt-proof ball bearings. Helical cut, alloy steel gears.  $\frac{3}{4}$ " heavy duty Jacobs key chuck.

**It Grinds**—sharpens your tools right on the job by using emery wheel with arbor to fit into chuck of electric drill. Easy, quick, convenient.

**MILWAUKEE ELECTRIC  
TOOL CORPORATION**

106-109 N. WATER STREET  
MILWAUKEE  
WISCONSIN



Every Night  
Regularly



**TORK  
TIME  
SWITCHES**

All-Electric

191 SP  
1650 Watts  
list \$12.75

962 DP  
4000 Watts  
list \$15.00

BUY through your JOBBER  
Send for your copy  
of FREE BULLETIN

The TORK CLOCK CO., Inc.  
Mount Vernon, New York

**OK**  
**ILSCO**  
**SOLDERLESS CONNECTOR**  
**NOT LIMITED TO ONE  
SIZE WIRE**

Every ILSCO Solderless Connector takes care of different sizes of wires, both solid and stranded. This means simplified stock control and valuable time saved on the job. In addition, there are these other ILSCO features:

- NO flattening or separating of stranded wires.
- NO special tools required.
- NO set screw contact.
- NO shearing effect whatsoever.
- NO castings or forgings to increase their cost.

NO need for you to search any longer for the PERFECT Solderless Connector... WE HAVE IT! Six Sizes Take Care of All Wires from No. 14 to 1,000,000 C.M.

FREE—A large display board bearing mounted samples of ILSCO lugs. Address Dept. EC

**ILSCO COPPER TUBE & PRODUCTS, INC.**  
5629 Madison Road, Cincinnati, Ohio

*Morse Garage*

### Sweet Sugar

Biggest job around industries of Yonkers, N. Y., recently fell to veteran W. N. Barlow, Barlow-Reilly, Inc., and it's real sugar. A new liquified sugar processing plant is being installed in a group of large buildings, which means electrical modernization costing upward of \$150,000.

### Hot Wire Rustlers

Thieves are even stripping hot "high lines". Over near Chicopee, Mass., someone stripped 3600 ft. of bare copper from a "hot" 4600-v transmission line owned by the Municipal Light Department. Suburban families were without light and one farmer lost an incubator hatching of several hundred eggs. What next, rural line vigilantes?

### New Hand

NECA President Earl Peak will soon toss off some of the burden of local details. Young Jack Collins, football star and honor graduate of St. Benedict's College, takes up his new duties with Earl in September. Jack has been preparing intensively under the tutelage of his father, J. Walter Collins, veteran Secretary-Manager of the Chicago Electrical Contractors Association.

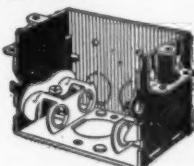
### Motor Repair Survey

"How many of the various types of industrial motors do you rewind in your shop?" That question intrigued J. G. Spaulding of the Spaulding Electric Co., Detroit. He made a survey which revealed a preponderance of 1200 and 1800 r.p.m. 3-phase motors running from 1 hp. to 15 hp. So he set up a stock of about 30 spare stators to take care of many rush week-end burnouts for companies who have no spares. Everybody gains because re-winds get regular standard work, overtime is avoided, and the customer has practically no delay.

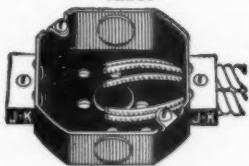




A few of the products in the complete RACO • ALL-STEEL • PRODUCTS line:



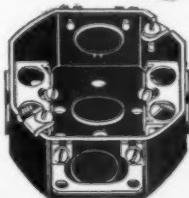
**Switch Box MC**—with XL clamps for armored cable



**Jay-Kay Box**  
**DO-25 N-JK**—refined J-K clamps on outside provide more wiring room



**Switch Box**  
**MF**—for cable, with adjustable fixture bridge



**Cable Box**  
**DO-22N**—equipped with external mounting ears

## YOU DON'T HAVE TO SLIDE WHEN YOU HIT A HOME RUN!

● A good, clean hit over the left field wall guarantees at least one run. There's no chance of being put out before you score.

Specifying and installing RACO • ALL-STEEL • PRODUCTS assure you of a home run every time because of their wide acceptance. And the preference for them eliminates the possibility of being caught "off base" any place along the line. When RACO • ALL-STEEL • PRODUCTS are used, the danger of loss of money and time is avoided. It isn't necessary to try to "steal home" by forcing materials into the job.

The switch boxes, outlet boxes, cutout boxes, cabinets, fuse cabs and conduit fittings which bear the famous RACO and ALL-STEEL trade-marks have a total of more than 40 years of experience behind them. Engineering which keeps pace with modern wiring trends is your assurance that the nation-wide approval accorded these products will continue.

Adequate stocks of the complete line of RACO • ALL-STEEL • PRODUCTS are maintained by wholesalers in all parts of the country. Write for catalog and complete information.

Distributed Nationally by

**ALL-STEEL-EQUIP COMPANY, INCORPORATED**

623 JOHN STREET • AURORA, ILLINOIS

Factories: South Bend, Indiana • Aurora, Illinois



**RACO • ALL-STEEL • PRODUCTS**

SWITCH BOXES • OUTLET BOXES • CUTOUT BOXES  
CABINETS • FUSE CABS • CONDUIT FITTINGS



**FLOOR BOXES and**



No. 130 "LATROBE"  
ADJUSTABLE WATERTIGHT  
FLOOR BOX

No. 130 Box with No. 207 Bell Nozzle. Cut-away view illustrates how tapered unit receptacle fits tapered opening in adjustable ring. Design eliminates many small parts. Cover plate  $3\frac{1}{2}$ "—overall height  $3\frac{1}{2}$ ".



No. 285 DOUBLE DUPLEX RECEPTACLE NOZZLE

The most attractive, compact and easy-to-install fitting on the market. Shown in illustration with No. 200 Cover Plate.

**FULLMAN MFG. CO.**  
*LATROBE - PENN.*

Sell and install LATROBE—the complete line for residential, commercial and industrial work. Catalog on request



No. 110 "LATROBE" WATERTIGHT BOX

Cut-away view of No. 110 Box showing how the tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

### MINERALLAC HANGER

### HERWIG

OUT-DOOR LIGHTING FIXTURES

Apartment Buildings  
Public Buildings  
Bungalows  
Churches  
Schools  
Garages  
Country Clubs  
Warehouses  
Residences



#### A FIXTURE FOR EVERY OUTDOOR PURPOSE

*Cast Iron or Bronze*

Send for our

#### Catalogue No. 40

200 Illustrations

The

Herwig Company

MANUFACTURERS

Established 1908

1753-59 Sedgwick Street

Chicago, Illinois, U. S. A.

Modern Numbers Shown on P. 4 & 5  
—Also Furnished in Cast Aluminum  
—Polished or Satin Finish

*More Goods*

#### Truck Data

Some contractors who think service trucks are a minor item of overhead may be interested to know what was found out by making an analysis among a group of Westchester County (NY) electrical contractors. An average of 20 miles use per day was reported by more than sixty contractors, and detailed figures from about ten firms showed actual costs to average 12 cents per mile, according to John McIntyre, secretary of the Westchester-Fairfield Electrical Administrative Board, Inc., of White Plains.



**INDUSTRIAL MINDED** — Philadelphia industrial contractors are engaged in a campaign to sell "certified" contractors to local industries through the cooperation of the Electrical Association. A leader in this program is Howard L. Miller of the Utilities Engineering Company. As vice president of the Electrical Association, Howard has contributed helpful suggestions based on his experience as an industrial specialist.

#### Looking Ahead

Hartford, Conn., has a department store addition under way in which the lighting layout is circuited for a load of 8 watts per square foot. H. H. Mandly, who has the \$300,000 wiring contract, cites this job as an example of long-range planning for adequate copper.

#### Farm Revenue

A \$900 wiring job is welcome almost anywhere, but is hardly expected from a farmer. George Greger of the Electrical Construction Co., Easton, Pa., recently did such a job, and now appreciates rural electrification.

## More Profit for you—with

**Badger** Synchronous  
Electric  
**TIME  
SWITCHES**

### Now Glass Insulation

Spun glass insulation for motor coils is now past experimental stages, reports E. G. Young, president of the Frank Ridlon Co., Boston. A laundry customer had some 7½ hp. a.c. extractor motors with Class B insulation which had to be rewound every six months. They attained temperatures of 400 deg. F. under frequent automatic heavy-duty reversing service. Now these motors have been fitted with spun-glass-insulated coils and everybody reports good results.



PROTESTING WPA FUNDS for building permanent projects, Wm. H. Rogers, secretary of the Ohio Building Trade Employer's Association reports that organization is backing a resolution recently forwarded to Washington by the Ohio Construction Council proposing that all such construction be handled by contracting firms. Mr. Rogers, is associated with the Gustave Hirsch Organization, electrical engineers and contractors of Columbus, Ohio.

### Shopmen "On Location"

No, this isn't about an armature winder gone Hollywood, but about a novel set of portable equipment for reconditioning elevator sheaves right at the job. Recently the Maintenance Company, Inc., had to regroove the sheaves on a large Brooklyn freight elevator. So portable equipment was set up in the penthouse and the job completed without dismantling and trucking this heavy apparatus to the Maintenance Company's Manhattan shop.

### Save With Increased Load

George L. Parks of East Penn Engineering Co., Reading, Pa., studies his customers' power contracts closely. He recently found several store keepers who could actually save on their bills if more energy was used. Which makes it much easier to sell high intensity lighting, says George.

because you can wire 'em and forget 'em. They are easily installed and are dependable and economical for such installations as store windows, signs, apartment house hall lights, air conditioning, etc.

Repeat business is almost as automatic as the switch. Every installation means a satisfied customer who is going to remember you as the fellow who can do a job right.



### THE RELIANCE LINE OF TIME SWITCHES

is comprised of the RELIANCE, RACINE, BADGER and the new MODEL W RELIANCE. The 31 standard types in the line are the result of over 28 years of concentration in this highly specialized field. Full information on this profitable line will be gladly sent on request.

Latest in design and construction. Furnished in single and double pole types and in either cast iron or sheet steel cases. Two types are available in 8-day hand wound construction for use on D.C.

Write for complete descriptive literature and price sheet..

**RELIANCE AUTOMATIC LIGHTING CO.**  
1937 MEADE STREET      RACINE, WISCONSIN

The easiest way to get ahead in electricity—

through the other man's experience as found in books



Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

*Terrell Croft's*  
**AMERICAN  
ELECTRICIANS'  
LIBRARY**

(6 volumes—over 2,000 pages—fully illustrated)

In six really magnificent volumes this library gives the most thorough, most complete and easiest-to-understand treatment of the more specialized phases of electrical practice in print today.

**"How" and "why" for Maintenance Men**  
The books show the best ways to make installations for every type of conduit wiring job—they tell how to handle every kind of lighting and switch problem—they give tips on short cuts for saving time on routine jobs—they show the quickest and surest methods of locating and remedying circuit troubles. Alternating current armature winding, electrical machinery control diagrams and machinery erection are some of the things covered in detail.

**Diagrams**

In all, these books contain more than 1,000 clear, easy to follow diagrams, with wiring instructions written in simple language. It is unnecessary to tell you how valuable is this one feature alone.

**Small monthly payments**

You may examine these books free for 10 days by sending the coupon below, filled out. In addition, if you decide to keep the books you have the privilege of paying for them in easy monthly installments while you use the books. Make sure you are not passing up your best bet for getting ahead. Mail the coupon today

**FREE EXAMINATION COUPON**

McGraw-Hill Book Co., Inc.

330 W. 42nd St., New York, N. Y.

Send me Croft's American Electricians' Library, 6 volumes, for 10 days' free examination. If I find the books satisfactory, I will send you \$1.50 in 10 days and \$3.00 a month until \$17.50 has been paid. Otherwise I will return the books postpaid.

Signature \_\_\_\_\_

Address \_\_\_\_\_

City and State \_\_\_\_\_

Firm or Employer \_\_\_\_\_

Position \_\_\_\_\_ EC-9-38  
(Books sent on approval in U. S. and Canada only.)

**Adventuring  
In Wiring**

[FROM PAGE 16]

anticipate that because of actual field experience gained from these thousand jobs, formal approval will be granted in the 1939 revision.

The Detroit Edison Company has also pioneered in the sale of primary power direct to industrial customers. This program, which has been under way for the past twenty-five years, has benefited many of the large industrial contractors. To purchase primary power the customer furnishes and installs all primary equipment such as bus work, disconnects, transformers, and the necessary structures. These sub-stations are designed by the Edison company engineers. However, in purchasing the equipment and installing the wiring, the customer deals directly with his electrical contractor.

During the past ten years 300 of these privately owned sub-stations have been built. Capacities range from 80 to 50,000 kw. and the average cost for each station is approximately \$3,000.

So while auto plants pioneered in new applications of wiring and equipment to suit their mass production problems, the field of residential wiring has likewise been in active development in Detroit. It has seen a series of adventures that drew repeated criticism from other branches of the industry, and more adventures are projected in this effort to find the wiring system that through low cost will encourage adequacy.

# COMING

## Double-barrelled ammunition to HELP YOU SELL BETTER LIGHTING

*In*  
**OCTOBER  
ELECTRICAL CONTRACTING**

The theme: "Lighting Main Street in Survey Town". Based on an actual study of a typical medium-size city, this insert will contain 16 editorial pages showing where poor commercial lighting exists and how to sell good lighting at a profit. Tells how you can organize a lighting program and sell your own "Main Street."

*In*  
**NOVEMBER  
ELECTRICAL CONTRACTING**

The theme: "Industrial Lighting in Survey Town". In a similar manner to the "Main Street" insert in October, this section will treat with the industrial side of a typical city. The lighting requirements of various industries will be given and effective ways of selling this market.



**NEW SECRETARY** — The Grand Rapids Electric Club has played an important part in Wolverine State electrical affairs, and its eighty members depend on Robert Myers the new field secretary to keep things moving along. Active in helping to get some 2,000 contractors into the state association, the club is now spreading the adequate wiring gospel.

These editorial inserts present an effective background for a sales message on your products. Ask for full details of these inserts, with complete listing of editorial content.

**ELECTRICAL CONTRACTING**  
330 W. 42 ST., NEW YORK

**WADSWORTH**

*Announces*

# NEW 100 AMPERE SERVICE EQUIPMENT

NOW available in three 100 Ampere Styles:

Cat. #3813 —3 Pole, 125/250 Volt, Solid Neutral No Branch Circuits.

Cat. #3813BRW4—3 Pole, 125/250 Volt, A. C. Solid Neutral 4 Lighting Circuits, 2 "Renu-Fuse" Pull Cover Units.

Cat. #3813BRW8—3 Pole, 125/250 Volt, A. C. Solid Neutral 8 Lighting Circuits, 2 "Renu-Fuse" Pull Cover Units.

FINISHED IN ALUMINUM

WADSWORTH'S 3800 Line is NOW available from 30 to 100 Amperes. These devices meet the most rigid inspection requirements and Contractors recommend them for safe operation under all conditions.

"Renu-Fuse" Pull Cover Units equipped for two 60 Ampere cartridge fuses. When specified can be equipped with one 60 and one 30 Ampere unit for cartridge fuses. "Renu-Fuse" units can be used for Range and Water Heater connections.

See Your Electrical Wholesaler

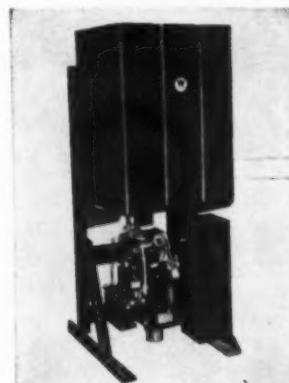
BUY WISELY . . . BUY WADSWORTH

*The* **WADSWORTH ELECTRIC MFG CO. INC.**  
Covington, Kentucky.

# EQUIPMENT News

## Indoor Circuit Breaker

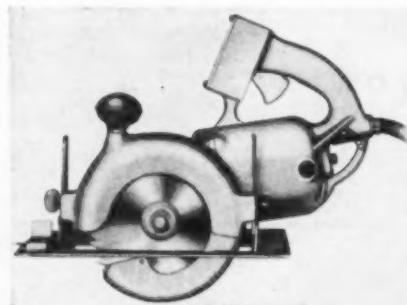
Type U De-ion indoor air circuit breakers are for use in central stations or industrial plants. Available in ratings up to 15,000 volts. Operate without oil or liquid, function in normal atmosphere and not dependent upon maintenance of any medium such as air pressure or a vacuum. Features are high speed arc control, arc resisting contacts, solenoid operation, universal mounting arrangements, and low operating costs. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE CIRCUIT BREAKER

## Electric Saw

A new model portable electric saw of 20-in. cutting capacity has been added to the Syntron line of tools. The features included tilting base for bevel cuts; oversize, excess powered universal motor; double pole, trigger switch; silent worm gear drive; and automatic telescoping safety guard. A 6½-in. combination rip and cross cut saw blade is supplied as standard equipment. Syntron Company, Box A, Homer City, Pa.



SYNTRON ELECTRIC SAW



BENJAMIN DUST-TIGHT COVERS

## Dust-Tight Covers

These hinged dust-tight glass covers offer economies in maintenance for reflectors installed in locations subject to dust, grime and smoke. Assembly consists of two parts; cover including glass and gasket and band with hinge which clamps to reflector bead. Covers fit all circular Benjamin reflectors having beaded edge where lamp does not project below reflector bead. Available for reflectors measuring from 8 to 22 inches in diameter. Benjamin Electric Manufacturing Co., Des Plaines, Ill.



HOLOPHANE CORRECTALITE

## Lighting Fixture

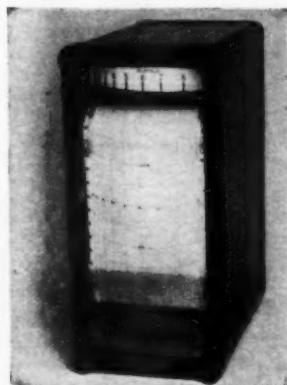
A semi-direct lighting unit, known as Correctalite, is for use in stores, offices, public building service areas, commercial display rooms. A prismatic light director controls reflected and direct light rays. Ceiling type fixtures are equipped with canopy cross bar and barrel nuts for mounting. Suspension type are of rigid 3-in. stem, ball and swivel construction, with slip canopy and arranged for direct attachment to outlet box by hickeys and extensions. All fixtures are regularly furnished with medium base porcelain sockets. Holophane Company, Inc., 342 Madison Ave., New York, N. Y.



CUTLER-HAMMER CONTACTORS

## Magnetic Contactors

Magnetic contactors for small continuous-duty single and polyphase motors. Long life of silver-to-silver butt-type contacts is featured because "twin-break" function reduces arc, and operation in a restricted pocket cools it. Vacuum impregnated magnet coil is accessible, assures high heat conductivity, withstands high operating temperatures without damage and is moisture proof. Available in 2, 3 and 4-pole construction with maximum ratings of 1½ hp. for single and 2 hp. for polyphase, also in skeleton form for built-in use. Cutler-Hammer, Inc., 228 N. 12th St., Milwaukee, Wis.

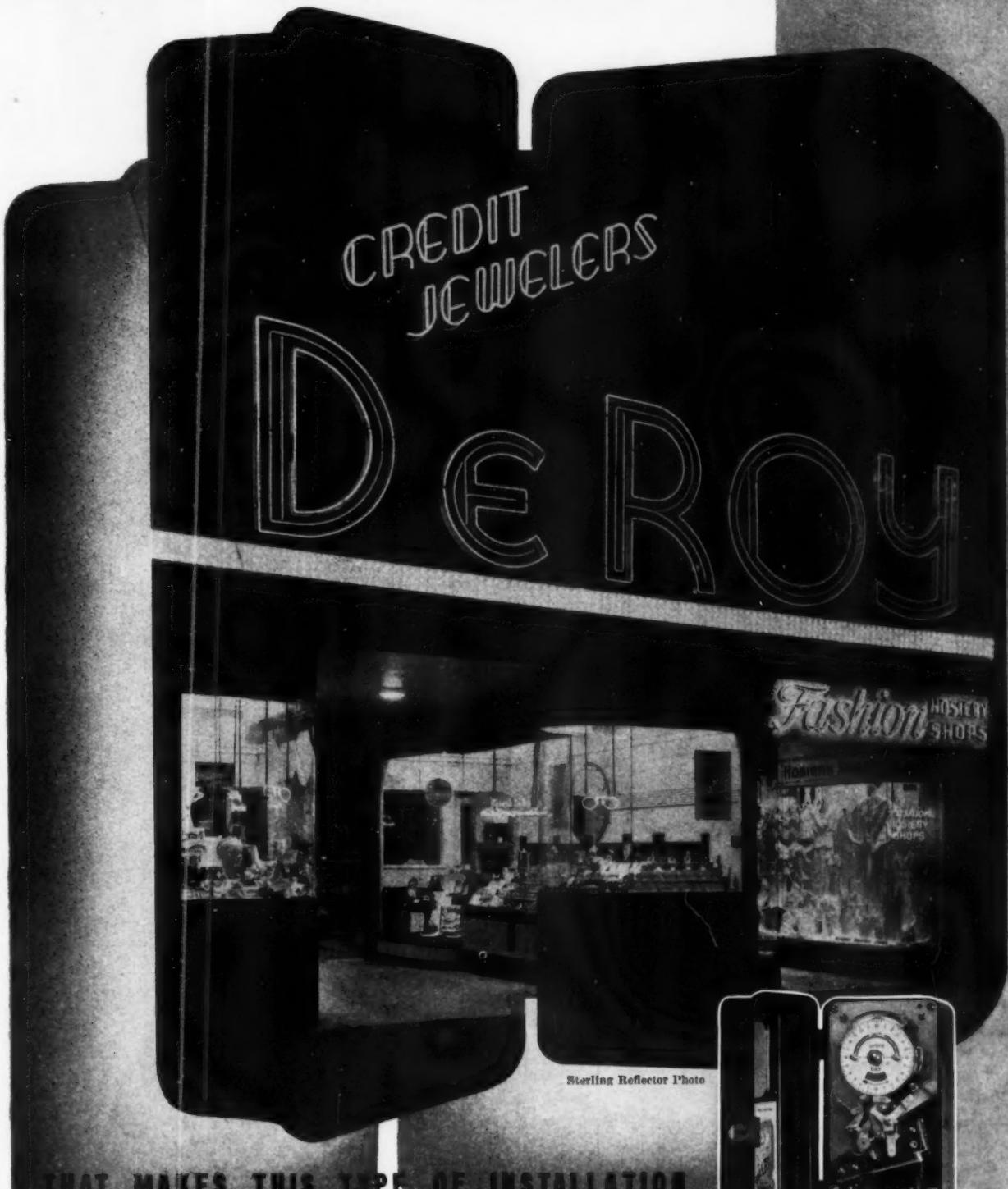


WESTINGHOUSE RECORDING INSTRUMENT

## Recording Instruments

The G-40 recording instrument is furnished with a broad line of movements to meet all conventional requirements in central station and industrial fields. One frame carries all moving parts including damping mechanisms. Measuring elements are of direct acting type and electromagnetic damping is used. Movements have high torque weight ratios, nominal volt-ampere burdens and good frequency performance. This line is available in projection mounting housing. Portable carrying details may be added to standard housings. Standardized terminals furnished with switchboard mounting recorders. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pennsylvania.

# THE UNSEEN HAND



WHAT MAKES THIS TYPE OF INSTALLATION

*Completely Automatic*

Because the average store owner has only a vague idea of the convenience a modern time-switch will bring him, the switch must prove its worth after it is installed. If you sell him a Sangamo Time-Switch you can rest assured that it will live up to every promise—that it will serve him faithfully for the life of the installation.

## NEW ASTRONOMIC DIAL TIME-SWITCH

The latest and most convenient in window lighting controls is the new, popular priced Sangamo Type KZ Time-Switch with Astronomic Dial.

**SANGAMO ELECTRIC COMPANY** SPRINGFIELD  
ILLINOIS



**THE BEST BUY  
—ASK US WHY**

## **SHAWMUT SHUR-LAG RENEWABLE FUSES**

*The CHASE-SHAWMUT  
COMPANY*



**NEWBURYPORT  
MASSACHUSETTS**

## **EQUIPMENT News**

[FROM PAGE 98]

### **Oil-Resisting Portable Cord**

A new type of oil-resisting portable cord, known as Type "OS", is also proof against actions of grease, gasoline, fats, vegetable oils, acids, alkalis, lye, soaps and other agents destructive to rubber. Has a tough jacket of Glyptal-Neoprene, containing no rubber. It is mold-cured in lead directly over core and given a waxed finish. For application in industrial plants, automobile service stations and garages, packing houses and soap factories. General Electric Co., Bridgeport, Conn.

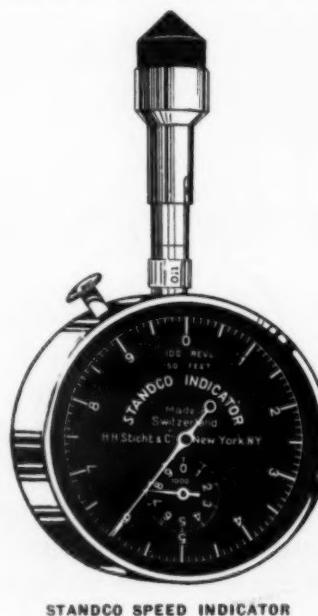


**G. E. OIL-RESISTING CORD**

### **Speed Indicator**

A single instrument for checking the speed of shafts and linear surfaces, which combines a revolution counter, surface-speed indicator, and a chronometer which times the period of test. The personal equation is claimed to be totally eliminated. A small hand designates one point on the scale for each 10 revolutions of the large hand. A press-in button and automatic timing device permits speed tests being made for 3-second periods, and the result is indicated on a calibrated scale to be read direct in minute values.

Standco speed indicators are made in four speed ranges, in which one revolution of the large hand indicates from 10,000 rpm for No. 2300 to 10 rpm for No. 2304. Equipment includes capped and pointed rubber tips, rubber-covered disk and case. Special fittings are available for measuring the speed of threads and yarns. Herman H. Sticht & Co., New York, N. Y.



**STANDCO SPEED INDICATOR**



**WESTINGHOUSE "BLACK LIGHT" LAMP**

### **Mercury Vapor Lamp**

A 100 watt "black light", high intensity mercury vapor lamp, developed for producing dramatic, weird or useful fluorescent effects. Lamp has a red-purple bulb which absorbs visible light but allows near ultraviolet radiations to pass. This portable lamp has the same electrical characteristics as the 100 watt high intensity mercury vapor lamp used for illumination and is to be used with same transformer. Designed life is 1000 hours. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.



**CORNELL-DUBILIER CAPACITOR**

### **Capacitor**

A new capacitor designed for power factor correction on distribution systems, to operate out-of-doors under all climatic conditions. Completely enclosed in non-corrosive metal cabinet, with special dust-proof buss compartment, this unit lends itself for platform or pole mounting. The capacitor featured here is a 180 kva., 4,000 volt, 3 phase, 60 cycle pole mounting unit. Cornell-Dubilier Electric Corporation, South Plainfield, N. J.

# *Are You Ready for* **AUTUMN FLOODLIGHTING BUSINESS?**

**LIKE THIS? · · · · ·**

Night football is growing in popularity! Schools and colleges are getting larger attendance and increasing gate receipts with floodlighting. The time is ripe now to cover the prospects in your community.



**AND THIS? · · · · ·**

Gasoline service stations will install Pump Island lights and floodlights this year. Proper illumination is growing more and more important in attracting the trade of motorists. Don't wait until it's too late. See your prospects now!



**AND THIS? · · · · ·**

Parking areas, industrial plants, business buildings—they're all lighting up this autumn! And there's real profit waiting for you when you show them the right way to do it. Let our engineering department help you with free floodlighting plans.



**SEND FOR THESE CATALOGS—NOW!**

"Arm yourself with the proper sales ammunition. Ask us to send you copies of these two bulletins—No. 71, 'Here's How to Light the Night,' and No. 62, 'Modern Lighting.' Write us today. We'll send along your copies by return mail."

*Sunny Lumen*  
THE GOODRICH REFLEXPERT



# **GODRICH**

ELECTRIC COMPANY  
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES & FACTORY, 2902 NORTH OAKLEY AVENUE, CHICAGO, ILLINOIS

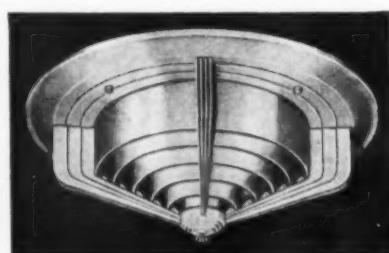
# CHECK Show Window and Store Lighting for NEW BUSINESS

To attract and hold trade against steadily increasing lighting intensities, many merchants in your community need better lighting.

You can create profitable business by selling



them **Sterling Reflectors** for show windows, coves and display cases, as well as **STER-LITE Louver-Controlled Direct Lighting Units** for interiors.



Sterling Engineers can help you by suggesting effective applications and furnishing modern layouts to meet special requirements.



**WRITE FOR THE  
NEW  
Sterling  
CATALOG.**

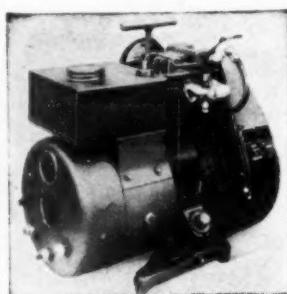
**STERLING REFLECTOR CO.  
1435 W Hubbard St CHICAGO**

EQUIPMENT  
*News*

[FROM PAGE 100]

## Power Plants

Full line of complete gasoline engine-driven battery chargers, power plants and lighting plants in "miniature" sizes. Available in 6-volt and 12-volt battery charger models and combination unit of 6/12 volts. Other "Junior" models include plants of 32 volts d.c., 110-volts d.c. and 110 volts a.c., ranging from 180 to 550 watts. Equipped with push-button starting. A.C. models guarded for radio interference. Larger models range from 300 to 10,000 watts in both a.c./d.c. and d.c. units. Kato Engineering Co., Mankato, Minn.



KATO "VEST POCKET" POWER PLANTS

## Magnet Wire

A new magnet wire, insulated with fiber glass, has been added to the present line of Deltabeston asbestos-insulated magnet wire. Deltabeston glass-insulated magnet wire, like Deltabeston asbestos-insulated magnet wire, is available in round, square and rectangular shapes. General Electric Co., Bridgeport Conn.

required are 1/20 of a second between each operation. Control has 1-RCA 6J5 amplifier tube and 1-UCC photocell 1105. Light source included with equipment is furnished with 32 CP automobile type bulb and will operate control at a distance of 25-ft. Four 1/2-in. BX knock-outs are provided in the control for wiring and all terminals can be uncovered by removing two screws fastening bottom plate. All permanent wires placed on removable strip. Life of vacuum tubes average about 3500 hours, while photocell should operate approximately 10,000 hours. United Electronic Industries, 43-37 Rawson St., Long Island City, N. Y.

## Indicating Lamp

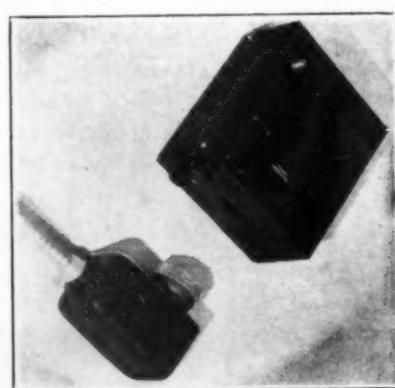
The No. 590 Bulls-I-Unit is designed to house and function with G.E. Co. Neon T4½ type, 120-volt lamp. Tip of lamp protrudes into shell of molded plastic lens, to effect 180 degrees of visibility. Unit is mounted in 1-in. dia. hole, in a panel up to 1½-in. thick. Diameter of cap is 1½-in. and lens 1½-in. Depth from front of panel 2 inches. No mounting screws are required. H. R. Kirkland Co., 75 West St., New York.



KIRKLAND INDICATING LAMP

## Splash Proof Motors

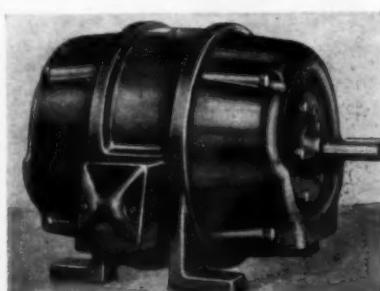
A new line of splash-proof motors, with the following features—cast iron construction; specially impregnated windings; baffling system prevents entrance of water or falling particles; improved system of ventilation assures low temperature rise; sealed ball bearings, accessible for lubrication in all mounting positions; conforms to NEMA specifications and furnished in all NEMA sizes and ratings. Diehl Manufacturing Co., Elizabethport, N. J.



UNITED PHOTOELECTRIC RELAY

## Photoelectric Relay

Model No. 50 photoelectric relay is a general purpose control suitable for many photoelectric applications. Operates only on 110-volt 60 cycles a.c. Requires minimum of three FC on photocell. Impulses



DIEHL SPLASH PROOF MOTOR



## *And AMPEROX Performite Building Wires will keep it Modern for Years to Come*

VISITORS from all over the world have been attracted to the new Government low-rent housing project at Old Harbor Village, Boston, Mass. This undertaking, built at a cost of over six million dollars, provides living units for 1016 families.

An important feature of this development is that it includes every modern electrical improvement, including lighting fixtures, laundry, electric stoves, refrigeration and air condition-

ing. The project was wired with American Steel & Wire Company Amperox Performite Building Wires and Cables.

Amperox Performite Building Wires and Cables are chosen by those who prefer rubber insulation of the "superaging" type. They conform in all respects to the requirements of Federal Specification J-C-106 covering single and multiple conductor cables, both braided and lead sheathed types, for

working potentials up to 5000 volts.

Also important in Amperox Performite construction is its Firelite flame-retarding braid which "pulls" easily, does not react to temperature changes, resists moisture and will not carry flame nor support combustion. We will be glad to send you complete information concerning this product.



**AMERICAN STEEL & WIRE COMPANY**



Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, Pacific Coast Distributors • United States Steel Products Company, New York, Export Distributors

**UNITED STATES STEEL**

# WRITE!

For  
INFORMATION ON

- POULTRY TIME SWITCHES
- STANDARD TIME SWITCHES
- INTERVAL TIMERS
- DEFROSTING SWITCH
- PROGRAM TIME SWITCH
- LINOTYPE TIME SWITCH
- DELAYED ACTION SWITCH
- FLASHERS — ALL TYPES
- PHOTO ENGRAVING TIMER
- HEATING PLANT CONTROL
- MOTOR REVERSING SWITCH
- FIRE DRILL SIGNAL SWITCH

Automatic Electric Mfg. Co.  
Mankato, Minn.

Keep Them  
"on hand"



**BURNDY**  
**SCRULUGS**

EQUIPMENT  
*News*

[FROM PAGE 102]

## Current Transformer

Type PC-137 portable current transformer is for general service where maximum in accuracy and breadth of operating range are required. It is of the combination "through" and "tapped" construction. Windings are insulated and fixed in relation one to the other and to iron core. "Through" capacities of 1000, 500 and 250 amperes obtained by passing conductor through opening provided. Capacities of 100, 50, 25 and 10 amperes provided with terminals mounted on top of case. Secondary terminals are marked and provided with short-circuiting switch for safety and convenience. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.



WESTINGHOUSE MULTI-RANGE TRANSFORMER

## Reflector Bowl Fixture

Type B-50 Permaflector ceiling fixtures for general service accommodate 300 and 500 watt lamps. This unit does not depend upon the bowl for light reflection or



PITTSBURGH PERMAFLECTOR FIXTURE



## "VISE TITE" — a NEW, BETTER WIRE CONNECTOR

A tapered thread makes the connector VISE TITE and trouble-free. Simple, double-protection, economical. WRITE FOR FREE SAMPLE



WILL TAKE  
Two or three No. 12 and  
one No. 18 Wires.  
Three No. 12 Wires.  
Two No. 14 and either  
one No. 18 or 16 Wires.  
Three No. 14 and either  
one No. 18 or 16 Wires.

Patent M Pending

**M & M COMPANY**  
21 MUIRHEID AVENUE  
TRENTON, NEW JERSEY



## The Champion of all KITCHEN Exhaust Fans

3 speeds  
Automatic Operation  
Super-powered Motor



## VICTOR In-Bilt VENTILATORS

More sales features, greater beauty, better construction, and easier installation—that's what you get in a Victor electric kitchen ventilator. Three models for your selection—for large homes, small homes and for low-cost speculative type building. Send for new ventilation data book, which shows complete Victor line and gives detailed specifications, prices, and discounts, today!

**VICTORELECTRICPRODUCTS, INC.**  
806 Reading Road Cincinnati, Ohio

Free Data Book  
Write for Yours Now

# "The Sign of a Better Job"



Take a look at the back of this Special Switch Fuss Type Switchboard and see how every detail of **FA** construction is designed to simplify installation.



## At No Extra Cost...

### **FA** Engineering Service Helps Electrical Contractors Protect Estimated Profits

Many successful Electrical Contractors get a great deal of help by using the **FA** Engineering Service to assure adequate and complete quotations that will protect their estimated profits.

More and more, they find greater value in this service — because every **FA** Sales Engineer is thoroughly trained and qualified by long experience to properly figure Panel-board and Switchboard requirements of any job, no matter how complicated it may be.

There is no charge for this service! It protects against underestimating and the inevitable cost of unforeseen extras. It is of particular benefit on special or "tailor-made" jobs.

There are 30 conveniently located **FA** Engineering Representatives in the U. S. and Canada.

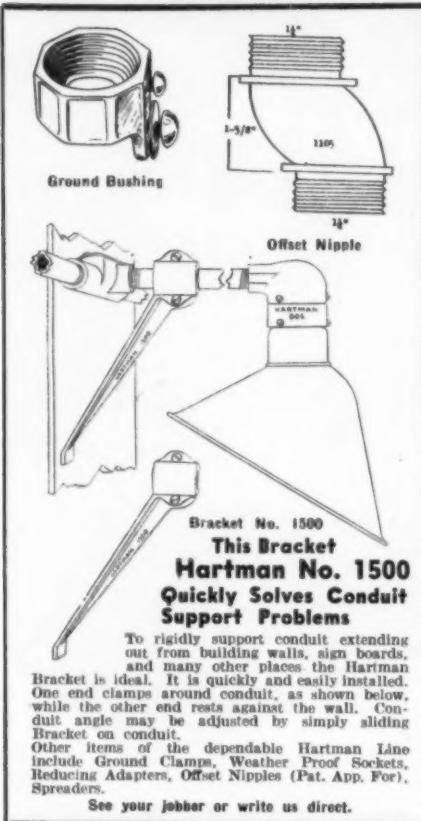
Make it a regular practice to get their help. It protects your estimated profits — takes a lot of work and worry off your shoulders — saves your time — assures adequate quotations — promptness — and a workmanlike job that helps maintain the good reputation you have so carefully built on the solid basis of doing a better job.

#### *Standardized* **PANELBOARDS** **CABINETS** and **SWITCHBOARDS**

Frank Adam Electric Company manufactures Standardized Panelboards, Cabinets and Switchboards for use in all types of construction work from the smallest residence to the largest public building . . . **FA** Standardized Products are listed in Catalog No. 56.

**Frank Adam**  
ELECTRIC COMPANY  
ST. LOUIS

\* THE HARTMAN LINE \*



**B. HARTMAN** 708 W. Esther St.  
Box 788 W State St.  
Long Beach, Calif.

EQUIPMENT News

[FROM PAGE 104]

distribution. A silvered glass reflector employs the 20-in. diameter bowl only for enclosure. Equipped with stem hangers for ceiling suspension. Finished brush aluminum with polished edges. Pittsburgh Reflector Co., Pittsburgh, Pa.

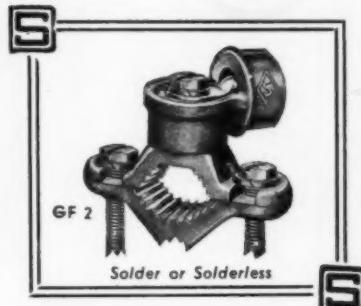


G. E. TIME SWITCH

Time Switch

This new automatic time switch, Type TSA-14, is designed for use in a wide variety of applications such as process timing and sign flashing. Time cycle of switch is fixed dependably and accurately as contact-making mechanism is driven by a Telechron motor. Dial of instrument is marked in per cent of total time. Percentage of "on" time may be varied by user by rotating dial until desired percentage of "on" time is indicated by pointer. Easily attached to knockouts of junction or switch box. Silver contacts rated 10 amperes, 230 volts. A relay should be used for higher rating circuits. General Electric Co., Schenectady, N. Y.

SHERMAN  
RIGID GROUND  
FITTINGS



- Reliable
- Dependable
- Economical
- Complete Line

GF2 may be used either as a solder or solderless fitting for rigid conduit.

A type for every requirement.

Send for Trade Bulletin No. 12

**H. B. SHERMAN MFG. CO.**  
BATTLE CREEK, MICH.



Business cards on book form stock made by Wiggins, zip from a pad with perfect edges. Carried in a leather case, they are ideal for salesmen.

**That vital  
first impression!**

It is here that sales are made or un-made before salesman or buyer knows it. And if it is what you want it to be, the man you are soliciting will always be "in"—and he won't rule your figures out if they're not the lowest.

A first impression by a salesman who presents a *Genuine Engraved* business card done by Wiggins often says more about a firm's integrity or the quality of its product than a dozen preliminary letters.

We will gladly quote on any quantity of business cards. Send a sample of what you are now using.

The John B.  
**WIGGINS Company**  
1173 Fullerton Avenue Chicago  
Engravers since 1857

Electrical Contracting, September 1938

**The MARR CONNECTOR**

for the  
**PERFECT JOINT**

Make your connections the modern, easy way. No messing with solder—A screwdriver and a twist is all you need with the MARR.

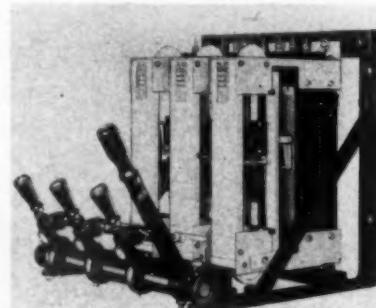
Write today for a free sample and make your own tests.

*Approved by Underwriters*

**THE RATTAN MANUFACTURING CO.**

552 STATE STREET  
NEW HAVEN, CONN., U. S. A.

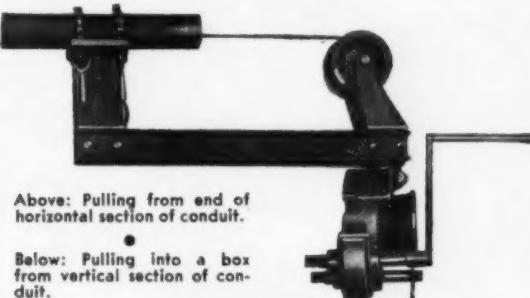
GENERAL SALES AGENTS HATHAWAY AND CO.  
220 CHURCH STREET, NEW YORK, N. Y., U. S. A.



WARD LEONARD AUTRASTAT DIMMER



**For faster, better,  
easier work**

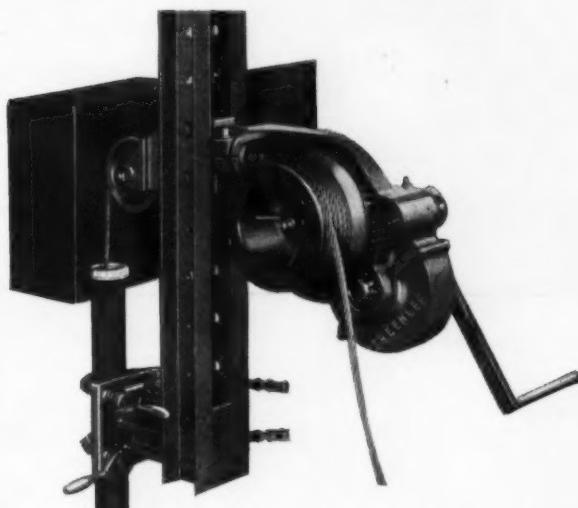


## An Efficient Cable Puller Portable . . . Easy to Anchor

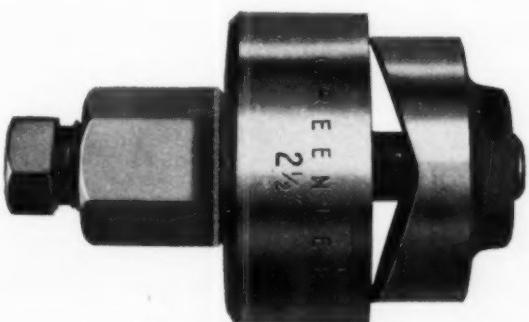
To the right is shown two views of the new Greenlee Cable Puller. Here is a tool in a class with Greenlee Hydraulic Benders as a labor-saving device. It has been designed to provide the maximum in power, ease of operation, portability, and convenient, positive anchorage.

The method of clamping is simple and positive, taking conduit from 2 to 5-inch. Clamping is done directly on to the conduit through which the cable is to be pulled. This permits pulling in line with the conduit and prevents the loosening of hangers. The drum can also be operated as an ordinary winch, since a base is provided on it for bolting to a plank.

Complete information on this new tool can be had for the asking. Use the convenient coupon and save time.



The Greenlee Cable Puller will exert a pull of 7500 pounds and has two speeds. Provision is made for two operators, when required, using cranks or ratchet wrenches. Can also be driven by a portable electric power unit. It weighs only 170 pounds and, for easier portability, the tension drum, weighing 85 pounds, can be removed from the bracket.



## Larger Knockout Punches

For a number of years we have made Knockout Punches for cutting holes for conduit from  $\frac{1}{2}$ " to 2" sizes. Now we have increased the range of this popular line by adding two sizes, Nos. 738 and 739, to cut holes for  $\frac{1}{2}$ " and 3" conduit. These differ in the drive arrangement, in that they have a double-diameter screw and a nut.

For complete information on our line of Knockout Tools, also on the new Radio Chassis Punches, use the attached coupon.

## Other Money-Saving Tools

### Hydraulic Conduit Benders

Hydraulic Pipe Pushers      Joist Borers  
Electricians' Bits      Bit Extensions

----- Mail This Coupon To-day -----  
**GREENLEE TOOL CO., ROCKFORD, ILL.**

Please send information on the following tools:

- |   |  |   |
|---|--|---|
| <input type="checkbox"/> Cable Puller   | <input type="checkbox"/> Conduit Benders       | <input type="checkbox"/> Pipe Pushers   |
| <input type="checkbox"/> Knockout Tools | <input type="checkbox"/> Radio Chassis Punches |   |
| <input type="checkbox"/> Joist Borers   | <input type="checkbox"/> Electricians' Bits    | <input type="checkbox"/> Bit Extensions |

Name .....

Address .....

City ..... State .....

My Jobber is .....

**GREENLEE TOOL CO.**

**ROCKFORD, ILL.**

# "But you CAN'T have gold wiring Mrs. Gotrocks . . .



*—it isn't even listed  
in the Buyers Reference!"*

Many electrical men believe that if it isn't in the Buyers Reference "there ain't no such animal."

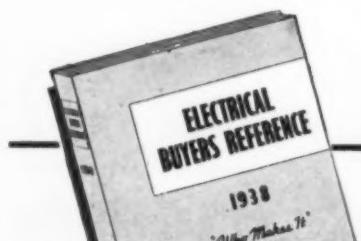
We do our best to live up to this reputation. Throughout the year, a staff of editors checks and re-checks every known electrical and allied product — trade and company names — addresses.

Once a year this information is published in the Electrical Buyers Reference. It is as complete as human care and vigilance can make it.

We lay no claim to perfection, however. There *may* be gold wire for Mrs. Gotrocks. But for every practical purpose you'll find the Buyers Reference has all the answers.

Keep your copy handy. It will save you time and money.

The Looking-Up-Place for  
Everything Electrical



## ELECTRICAL BUYERS REFERENCE

ELECTRICAL CONTRACTING EDITION

A McGraw-Hill Publication • 330 West 42nd Street, New York

[FROM PAGE 106]

the characteristics of an auto-transformer with an infinite number of steps. Low losses result in a minimum amount of heat dissipation. Will control loads from 10 watts up to maximum rating of dimmer with the same rate of change in intensity.

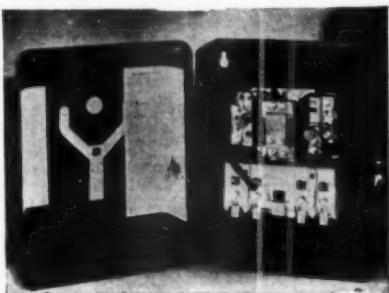
Available in two sizes; 1000 watts maximum capacity and 4000 watts maximum capacity, for use on 110-120 volt, 50-60 cycle a.c. Can be assembled in any of the forms of angle iron framework, and provided with such control features as are available for Vitrohm resistance dimmers. Ward Leonard Electric Co., Mount Vernon, N. Y.



CONTINENTAL  
NUMBRILITE PUSH

#### Number Light and Push Button

A combination illuminated house number and push button designed for new jobs and for replacing existing door bell installations. Number light bulb operates from the two push button wires. No additional wiring needed for old or new door bell and push button installations. Made in de luxe solid brass or bronze, and standard bronze plated models. Continental Mfg. Co., Inc., New York, N. Y.



WESTINGHOUSE LINESTARTER

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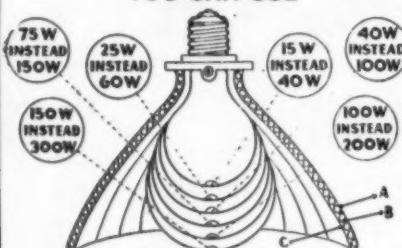
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